THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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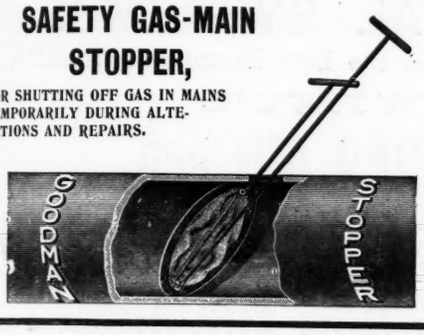

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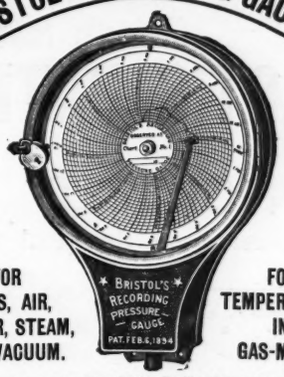

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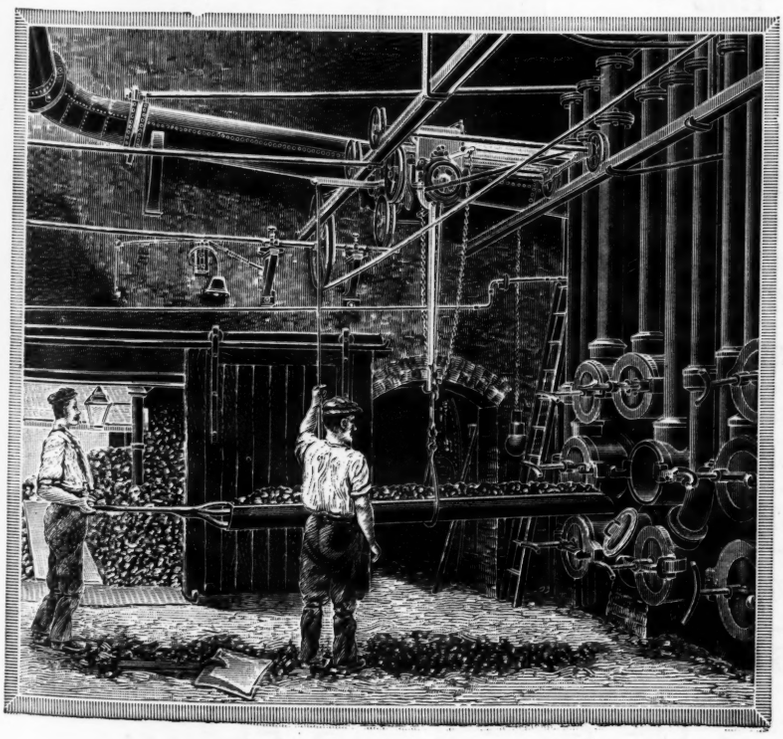

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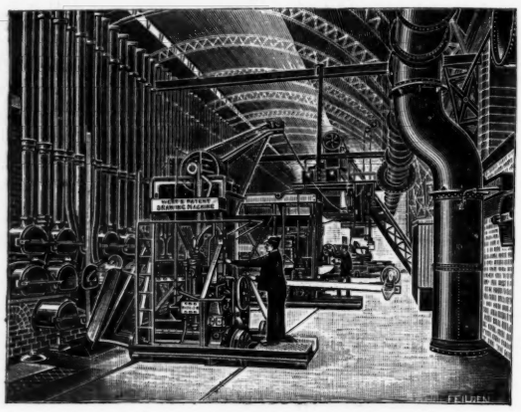

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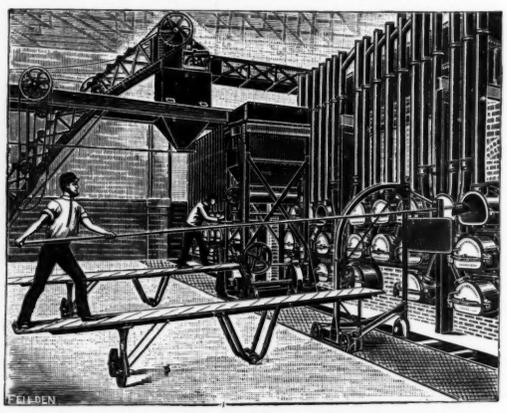

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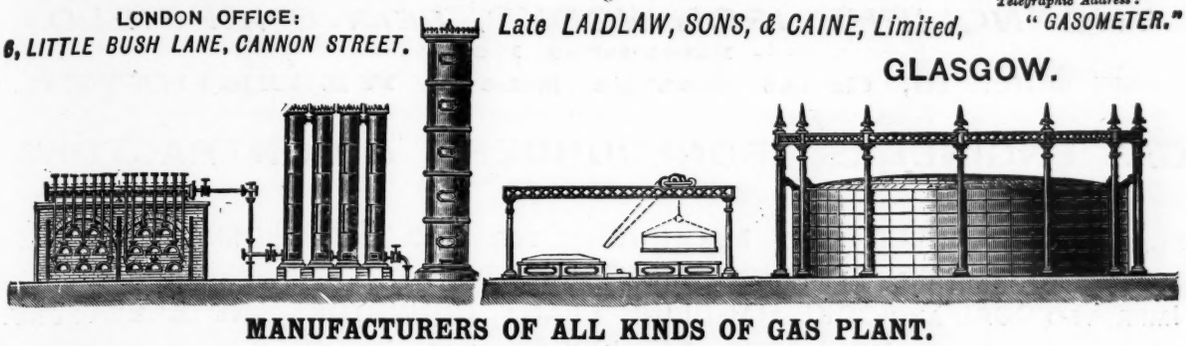

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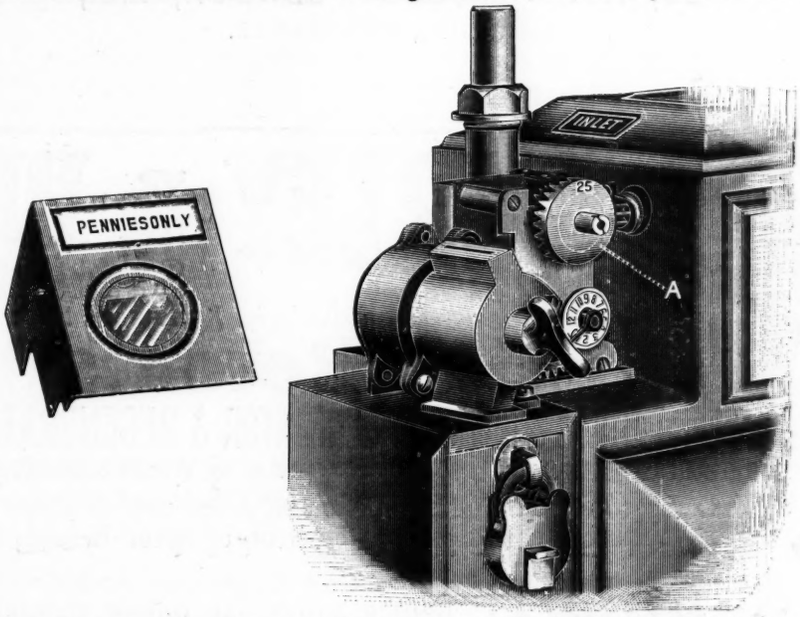

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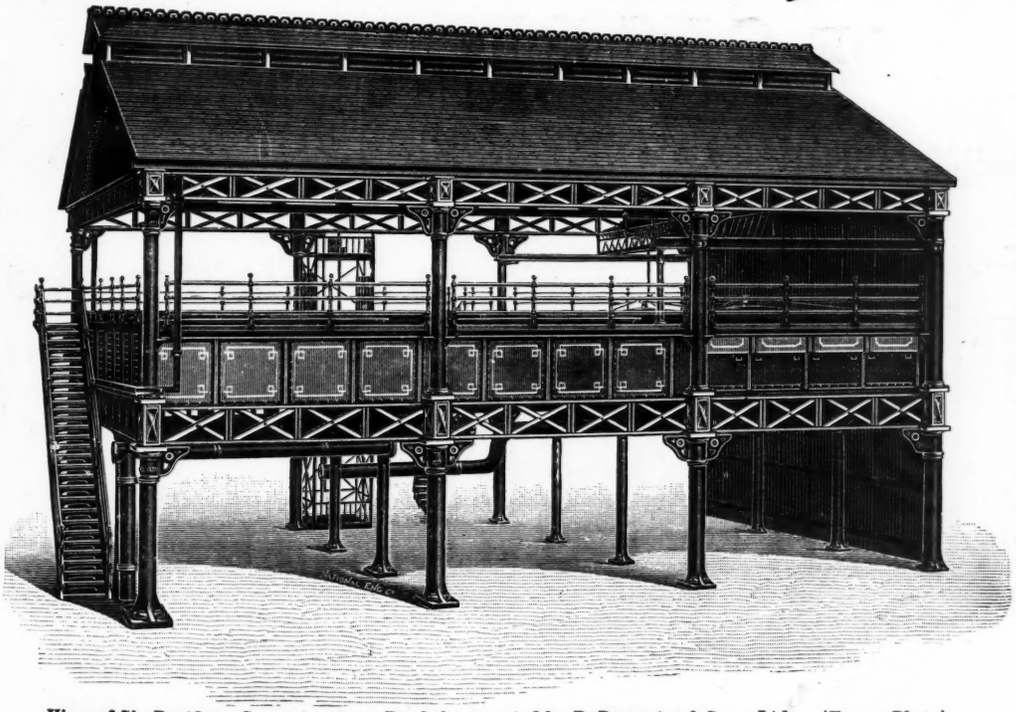

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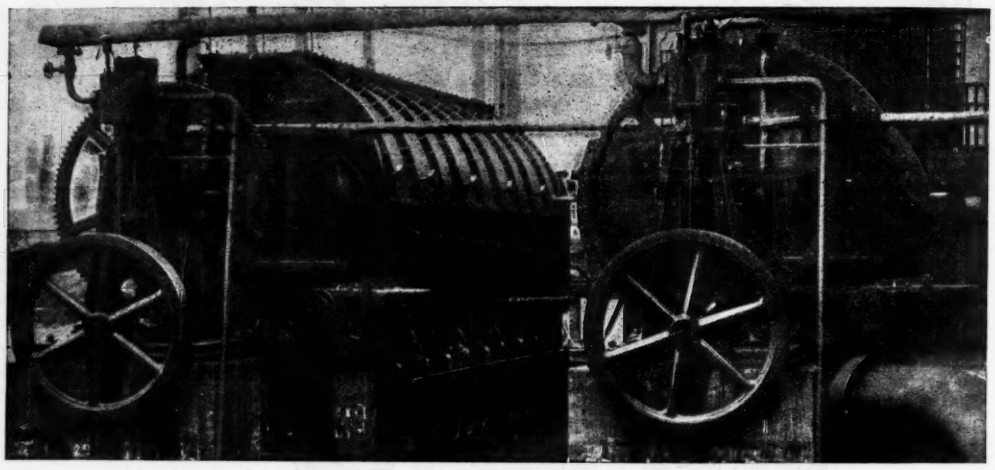

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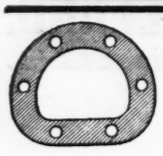

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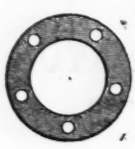

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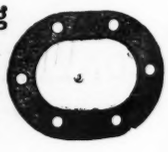

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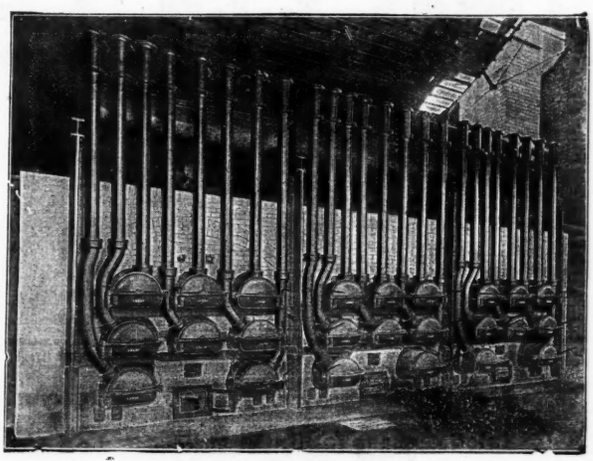

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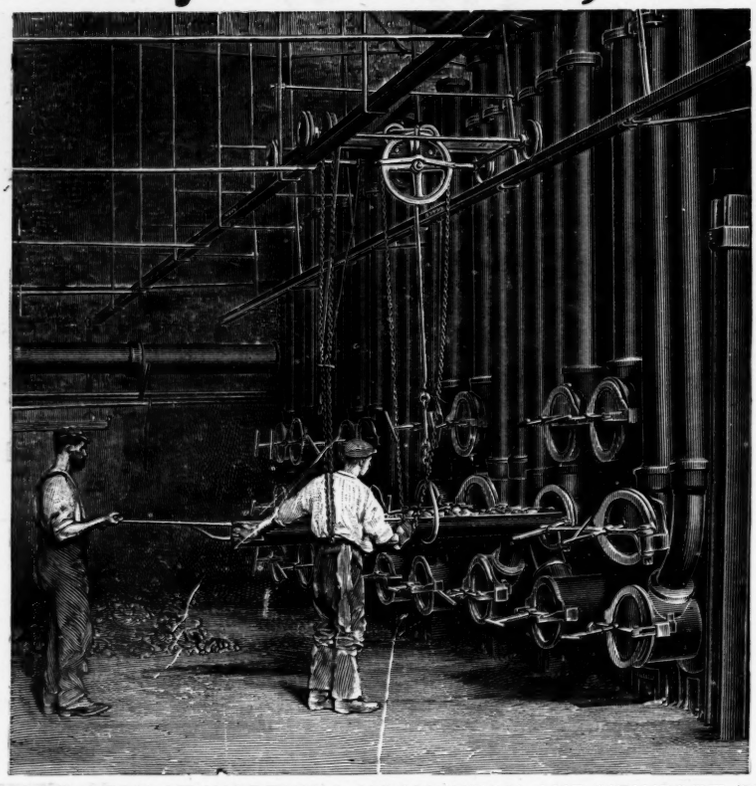

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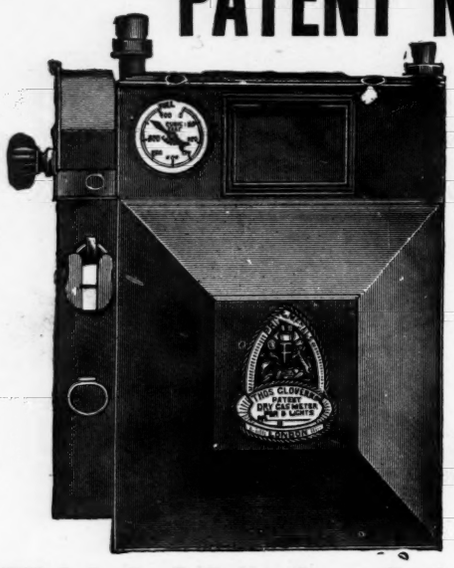

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EDITORIAL NOTES.

1901.

A Retrospect.

THE year which ends to-day has been marked throughout its eventful course as being more than commonly noteworthy, by reason of its opening a new century. It has taken two years to completely work out this idea of the closing of one century of Christian chronology and the starting of another; and now there is distinct relief in the knowledge that this particular vein of current speculation has been, through efflux of time, completely exhausted. Never more shall the topical orator crystallize his commonplaces on this thread of so general obviousness. One might be tempted to wonder whether the presidents of learned and technical societies a hundred years hence will be equally attracted to the same cast of retrospective observation. But this would be to perpetrate another banality of the kind from which we have just expressed satisfaction for deliverance. Yet, after all is said, retrospection, whether of the remarkable things of a year or a century, is, within limits, and in a proper place, a very reasonable and helpful intellectual exercise. As the world, and as individual man, grow older, they find more and more solace and inspiration in the records of the past. Retrospection and reflection are, in truth, as necessary and suggestive as mere imaginary forecasting of the future is apt to be idle and illusory. The close of the past century finds civilized humanity more self-conscious than it was at the beginning; and this is a quality which, when it once declares itself, must of its own essence persist. It will live upon itself, if no better nutriment is supplied; and the best corrective of this destructive habit is to chasten the generation which suffers from it by an occasional reminder of the excellences of the men of old time. There is a great cry of Progress at this present juncture of the Past with the Future. Many heads of the emptier sort, or of those over-filled with ephemeral notions, appear to consider that every change in the existing order in civilization which appeals to them as being something desirable, is necessarily an advance, and an advance in the right direction. There is nothing like a glance backward to sober such sanguine expectations. In the light of the fullest possible instruction in the ways of the world, its movements are seen to partake much more characteristically of the nature of flow and ebb, of systole and diastole, than of uniform progression.

By the same token, the characteristic of the past year in the age-long history of the land we live in will probably be recorded with the minus sign. Not that the country has positively declined from a previously-attained level, if everything is taken into consideration; but there has indubitably been a decline in some respects, and some loss. The year opened under the shadow of a war for the very existence of the British Empire, which has dragged along ever since. Before the first month had passed, the greatest figure of all living—Queen Victoria, of blessed and glorious memory—was gathered to her ancestors; and His Present Majesty, King Edward VII., was called at a ripe age to fill the vacated throne of All the Britains. Such a demise, of such a throne, was bound to have far-reaching and disturbing effects upon the affairs of the realm. Then, in the unaccountable fashion of such movements, many kinds of business declined, and the prices of coal and iron fell. The country began to experience the after-effects of the abnormal activity which had enabled the coalowners to obtain fancy prices for their output. The high prices of all kinds of structural materials and work constrained buyers to cut down and put off their orders, with the natural result. The continuance of the war in South Africa, at an estimated cost to the British Treasury of a million-and-a-quarter sterling per week, served to keep many important trades busy, and to absorb a sensible proportion of the able-bodied manhood of the population. It has therefore been anything but an unmixed evil to the nation. The ease with which the strain has been borne, both by the finances and the people of this country, is almost too great a phenomenon to be perceived by those who are nearest to it. The fact has nevertheless provoked such an outburst of animosity from nearly all alien races as will prove a useful warning to British capitalists in future, as to where their funds and enterprise may be most safely ventured. It is not too much to say that the past year has once more revealed England facing the rest of the world, as she did when the century began; but this time not alone, for her daughter-nations have been with her.

The necessity for additional revenue was met by increasing old taxes and customs, and, in part, by re-imposing an export duty of 1s. per ton on British coal. The impost was bitterly resisted by coalowners and miners, who, for a wonder, discovered a common ground of self-interest in this opposition to what everybody else regarded as being a very proper tax. The same parties have been at variance ever since, as is more usual, as to who should bear the loss of profit due to the fall in coal values, which has been considerable. The depreciation of the value of iron, which set in early in the year, began it. Thus was once more verified the familiar observation that iron will indicate what coal will do. Consequently, when the big gas coal contracts came to be made later in the year, they were concluded at an average reduction of 8s. per ton upon the prices ruling the previous season. At the same time, the value of coke fell in rather more than the proportionate ratio; the wholesale quotation for London being 12s. 6d. per ton. This, and the decline of other residuals, prevented the gas companies of the kingdom from immediately reducing their prices of gas to the lowest figures prevailing before the general advance. Still, reductions of about 75 per cent. of the advance were either made or promised in many instances. It is worth recording that some undertakings had not raised the price of gas at all—having contracts running that enabled them to tide over the pinch. The price of gas oil for making carburetted water gas fell sympathetically with that of coal. The course of the markets for gas residuals has been one long disappointment. Sulphate of ammonia commanded a fairly uniform price, averaging about £10 10s. per ton; but all the much-vaunted progress of chemical science did not benefit the producers of tar, which was hardly saleable at more than its worth to burn under the retorts. The cost of money was unfavourable to those gas undertakings which happened to be short of capital. Temporary loans from bankers ruled very dear—a matter which did not burden gas companies alone. It has become very general for local authorities to carry on their trading enterprises with the aid of money borrowed from their bankers; and this has often meant paying for large sums, in cash, at more than its earning capacity in the business. We usually cite the market price of the ordinary stock of the Gaslight and Coke Company as an indication of the current value of gas capital. The 4 per cent. consolidated stock began the year at 94-96, and touched par value before the end of the twelvemonth.

The experience of the Gaslight and Coke Company as regards their financial and general affairs was not of a pleasant character. With the ordinary stock at a discount—albeit only nominally, and as an effect of its conversion—it was unlawful to issue the remaining capital. The Company's Money Bill for the year was withdrawn out of deference to the hostility of Parliament. Ultimately, by the adoption of exceptional measures, the Company succeeded in the autumn in raising the fresh capital required. The gas consumption in the Company's district being at a period of arrested growth, the Directors did not give notice of any intention to renew their struggle with Parliament The South Metropolitan Gas Company obtained extended capital powers as the reward of an application to Parliament; and also received permission to purchase, by agreement, the works and undertaking of the Gaslight and Coke Company on the Surrey side of the River Thames. The Company secured statutory sanction for the issue of fresh capital to employees and consumers, by a modified sale clause. The Directors decided to expedite the reduction of the illuminating power of the Company's gas provided for by their Act of 1900; and they have given notice of a fresh application to Parliament for the abolition of the London Gas Referees

and the assimilation of the London gas-testing arrangements to those prescribed for the rest of the country by the Gas-Works Clauses Act, 1871. The Workman-Director system of the Company was renewed. The Commercial Gas Company adopted profit-sharing for their workpeople; and gave notice of an intended application to Parliament for an Act to consolidate and increase their capital, and permit of the reduction of the illuminating power of their gas. During the year the relations between the gas-testing authorities and the London Gas Companies became strained, owing to the injurious and pedantic requirements of the former. Dr. Williamson retired from the office of Chief Gas Examiner, and was succeeded by Lord Rayleigh, F.R.S.

One of the most striking features of the year was the vehemence with which the modern principle of trading by municipal bodies was pushed, in and out of Parliament, notwithstanding the opposition of statists to the unnecessary increase of local debt, and the revelations of hazardous corporation financing in regard to so-called remunerative undertakings at Plymouth, Warrington, Bath, and elsewhere. An insolent attempt to assert the right of a local authority to compete in gas supply with private capital was repelled and punished in the case of the Corporation of Leigh, Lancashire, and the Golborne Gas Company. The British public fell into the temptation to encourage actual competition in certain organized public supply services—including Exchange telephoning and electricity supply, and became greatly incensed over the consequent breakings-up of the streets necessary to carry the prescription into effect. During part of the year the chief streets of London were as they used to be at the height of the gas competition period. A clamour for the general construction of subways to contain all street mains and cables was accordingly raised. Notwithstanding the strong opposition of the gas-supply authorities and companies interested, a Company for the manufacture and distribution of Mond gas received statutory power to supply South Staffordshire; and late in the year the Company duly came out. Here and there spasmodic protests were raised against the distribution of carburetted water gas; but nothing came of them.

Speaking of municipal trading, it ought to be marked as a blot upon the year's record, that an unholy combination revealed itself as existing between the strongest partisans of this development of municipal institutions, and professed Labour politicians. One fruit of this agreement was a deliberate attack upon those members of public bodies, from Parliament down to the smallest District Councils, who happen to be shareholders in joint-stock companies. The "Labour Bench" of the London County Council—which is more inky-fingered than horny-handed—wanted to expend the money of the ratepayers in compelling statutory companies to publicly register the names and holdings of their proprietary. A so-called "Purity Crusade," which would have been farcical if its hypocrisy had not been too nauseating, was carried on all over the country against company shareholders in public life, mainly by persons who are in politics or Trade Unionism for a living. At the same time, although decent citizens revolted against the excesses of the self-seeking "purity"-mongers, both the law and public opinion grew distinctly stronger in antagonism to the perpetrators of real abuses. The responsibility of directors was made more definite; and ignorance of business went out of fashion as an excuse for betrayal of trust.

Besides those already mentioned incidentally, the parliamentary proceedings of last session relating to gas supply were not of special moment. A Corporation Bill for the compulsory purchase of the Hartlepool gas undertaking, without specific cause shown, was thrown out, and a measure of a similar character affecting Heckmondwike shared the same fate. These decisions are of great importance as establishing the precedent that local authorities are not to be gratified whenever they covet and desire other men's goods, even though they may be willing to pay fairly for them. A considerable amount of business was done in gas-works transfers from companies to local authorities—always, it is to be believed, on good terms. The Gas Companies' Protection Association efficiently watched over the fortunes of privately-owned gas undertakings, as these were threatened by the miscellaneous propositions introduced into Parliament. An incident directly interesting to gas companies was the publication of the report of the Royal Commission on Local Taxation. Certain enterprising gas-stove and fittings manufacturers started schemes for the fitting up of gas consumers' premises on the hire-purchase system, with the idea of helping gas companies short of capital to improve their business in this way. The prepayment meter system made headway in most localities.

There was not a very great deal of litigation over gas matters last year. The Crays and Bromley Gas Companies had a delimitation dispute, which ended in the maintenance of an ancient "understanding" not recorded in writing. A case from Nuneaton should clear up the law respecting the deliveries of coal under a contract. A water-pollution complaint went against the Tunbridge Wells Gas Company. A question of date in regard to an increased price of gas and its notification brought the Commercial Gas Company before the Magistrate. The responsibility for damage done to a gas-works by fire and explosion outside was settled in the case of St. Helens. Apart from these decisions, interest centres in the various decisions on appeals under the Workmen's Compensation Act, and on the various and peculiar patent litigation of the Welsbach Gaslight Company. A remarkable gas-meter dispute case was the action brought by the South Metropolitan Gas Company against the Bermondsey Borough Council in order to recover the value of gas that had not been paid for by reason of the deceit of a meter index. The Company recovered the full amount that was not barred by the Statute of Limitations. An interesting County Court case at Wakefield showed that, when a house is left without anyone in it, though not locked up, the time is not "reasonable" for a meter inspector's visit.

Incidental mention has already been made of the heavy fall in coal and oil prices which has characterized the past year. There was some agitation of the gas-oil market by reason of the exploitation of new fields in Texas, yielding a heavy oil which threatened to swamp all other supplies of the same class of petroleum distillate. The cheap and abundant American bituminous coal began to influence the foreign markets; and it was made clear that, in the event of the fields being connected to the sea by means of ship canals, and a sufficiency of freight being provided, many of the foreign and colonial customers for English coal might, in the near future, obtain supplies from the other side of the Atlantic. The question of the extent of the available British coal deposits was revived by Professor James Geikie, who advocated the appointment of another Royal Commission to investigate the subject.* A remarkable and extraordinary disturbance of the gas-coke trade occurred in connection with the discovery that this fuel may contain arsenical impurity, and so be unfit for roasting malt.

The annals of "Labour" for the year are chequered and voluminous. It would occupy more of our space than could be spared for the purpose to follow the thread of *pseudo*-political Labour developments, as these affected the coal and other markets in which the gas industry figures as a dealer. As regards the labour employed in the gas industry itself, the year's record is both encouraging and saddening. Substantial progress was made in confirming and extending the principle of admitting the workers to an industrial co-partnership with the old owners of gas-works, by the renewal of the South Metropolitan Workman-Director arrangement, and the adoption of profit-sharing at Chester, and also by the Commercial Gas Company. The former was the subject of a special general meeting of the Company, held during August, and was unanimously approved of. On the other hand, the Cork Gas Company had much trouble in dealing with disaffected workmen, traceable to agitation and Trade Unionism; and there was a gasholder explosion on the works which has never been brought home to the perpetrators. Gas Workers' Trade Unionism was responsible for at least two strikes in South Wales—not at gas-works—both of which failed of their object, and brought much loss and suffering on the deluded victims of agitation. The extension of the Coal Miners' Federation rule to South Wales had developments there, in the face of the falling coal market, which may occupy the Law Courts. At Lord Penrhyn's slate quarries, at Bethesda, a strike (aggravated by many circumstances of bitterness) prevailed for months, and is still nominally kept up by outsiders. A strike of Thames lightermen collapsed, after inflicting much injury upon trade and hardship upon the strikers. An alleged unnatural alliance between Labour politicians and the Progressive Party in British Municipal politics for mutual advantage was exposed in the newspapers, in connection with the allegation that Trade Union employees of local authorities do not return fair value for their high wages and

* Since this retrospect was put in type, a strong Royal Commission has been appointed (see p. 1739) to inquire into the question.

good treatment. The forces of militant Trade Unionism received a heavy blow by the judgments of the House of Lords in the Taff Vale Railway Company's case, which made the funds of the Unions answerable for any wrongs committed on their behalf; and also in the Belfast case of *Quinn v. Leathem*. Consequent upon the year's decisions in this regard, the practice of picketing and black-listing by Trade Unions has been greatly disparaged in circles where its value was best understood. The latest novelty of professional Labour politics is its anti-National spirit, which grew more conspicuous as the South African war went on. Another feature of the year was the futility of the existing provisions for the prevention of industrial disputes.

Turning now to the purely technical side of the gas industry. The matters that most occupied professional men were the merits of "low-grade" coal gas; the comparative advantages of inclined retorts and horizontal retorts with mechanical stoking; and the nuisance of naphthalene. A large amount of business was done in equipping gas-works with "conveyors." The novelties of gas-works technic comprised the starting of the first Dellwik water-gas installation at the works of the West Bromwich Corporation, and the publication of particulars of the Strache water-gas process. Although uncarburetted water gas is being manufactured in some places on a small scale for lighting by means of a specially adapted Welsbach incandescent mantle, the claim of common coal gas to be the best ordinary gas to make and distribute for general purposes was vindicated by Herr Schaefer, of Dessau, in a Paris Congress paper. Many gas companies began to maintain incandescent gas-burners for consumers. Brilliant progress was made during the year by intensified gas lighting, upon the incandescent principle, assisted with increased gas or air pressure. No headway whatever was made in the United Kingdom with automatic ignition for gas-burners. Persistent endeavours were carried on to compete with ordinary gas in lighting and heating, by means of petroleum incandescent burners and wickless oil-stoves. A great deal was said concerning the utilization of blast-furnace gases for the direct generation of power by means of gas-engines. The use of acetylene gas for lighting increased slowly. But the market for calcium carbide was overstocked, and prices fell heavily; while several carbide factories on the Continent stopped. The Harcourt ten-candle pentane standard lamp for photometrical purposes is entitled to be numbered among the new gas apparatus of the year. On the laboratory side of gas science, Professor Dewar continued his triumphant course in reducing the so-called permanent gases to the liquid form; and the new year begins with only one gas, helium, remaining unliquefied. The gas-engine fully held its own throughout the year as a motor, though attempts previously made to adapt gas power to the propulsion of tramcars and road vehicles fell flat.

Technical society meetings and congresses flourished exceedingly during the year. An International Exhibition being held at Glasgow, a very successful effort was made to place the gas industry well in evidence on the occasion. Accordingly, a grand display of up-to-date incandescent gaslights was organized here, under the auspices of the Glasgow Corporation; and in the autumn a Conference of Gas Engineers was held, at which some valuable papers were read. In Vienna, in June, there was a notable Gas Engineering Conference and Exhibition; and the previous year's Paris Conference gathered in the last of its promised technical communications. There was a very enjoyable visit of French gas engineers to England, to receive the hospitality of the English Technical Societies and the principal Gas Companies, in return for courtesies extended at all times, and especially in 1900. The Incorporated Gas Institute and the Institution of Gas Engineers held their usual meetings; but no progress was realized as regards the amalgamation of these bodies. Taken all round, the presidential addresses delivered to all the British Technical Societies were exceptionally good. The labours of years bore fruit in the standardization of meter-unions. A movement was started by the Southern District Association for systematically grappling with the naphthalene problem. An exhibition of gas apparatus opened at the Crystal Palace at the end of the year.

The gas industry suffered many personal losses during the year. Mr. J. F. D. Drory, Chief Engineer of the Antwerp Station of the Imperial Continental Gas Association, was a loss to this great corporation. Mr. F. Lane Linging, for about 38 years Secretary of the British Gaslight Company, Limited, and some time Chairman of the Crystal Palace District Gas Company, was deeply respected. Mr. W. L. Robinson bore a name renowned among those who founded the gas industry as it now exists. Mr. William Carr was a man of strong character, and a staunch supporter of the Gas Institute and the Manchester District Institution of Gas Engineers. Mr. J. Chadwick, late of Oldham, was a representative figure in Lancastrian gas engineering. Among the dead whose names were familiar to "JOURNAL" readers though not as belonging to the gas engineering profession, those of Mr. W. Woodall, Alderman Lennard (Leicester), Sir Courtenay Boyle, Dr. Stevenson Macadam, Dr. William Pole, Mr. Samuel Pope, K.C., and Dr. Andrew Stewart, will not be quickly forgotten. There have not been many official changes in the most important positions in the industry. Mr. G. C. Trewby did not, as was announced a year ago, retire from the service of the Gaslight and Coke Company; his health having improved during the year. There has been a re-arrangement of offices in this undertaking, however; and Mr. Trewby's title is now that of "Chief Engineer," with Mr. Goulden, late of Beckton, as "Assistant-Engineer." The Beckton charge was given to Mr. Iago, late of the Fulham works. In connection with these changes and others, it may be mentioned that several of the smaller town manufacturing stations of the Company have been, or will be, shut down. Out of London, Mr. John Young went from the Norwich to the Hull station of the British Gaslight Company, Limited, vacant by the retirement of Mr. A. Dougall. Mr. James Helps was made General Manager as well as Engineer of the Croydon Company on the resignation of the Secretary, Mr. Russell, who has been elected to a seat on the Board. Mr. W. Fiddes relinquished the appointment of Engineer to the Bristol Gas Company, and was succeeded by Mr. D. Irving. Mr. T. Glover went from West Bromwich to Norwich, and was succeeded by Mr. H. E. Copp. Mr. Edwin Smith retired from the secretaryship of the Birmingham Corporation Gas Department.

Happily, the year's chronicle of the British gas industry does not contain anything very serious in the shape of accident or casualty. The gasholder catastrophe at Cork, which was wilfully caused, still remains a mysterious crime. A purifier explosion at Stalybridge, by a sad coincidence, occurred on the day of the funeral of Mr. W. Carr, the late Engineer of the works. There have been the usual reports of suffocations and explosions on consumers' premises; and at one time it looked as if a "dead set" were going to be made upon those useful appliances generally known as gas "geysers." It blew over, however, on the understanding that care is to be exercised in future to provide as adequately as possible for the ventilation of apartments in which these arrangements are fitted. The work of gas manufacture and distribution has really been conducted with an unprecedented degree of freedom from serious disaster. Whether this result is to be attributed to the existence of a better understanding among gas workers of the nature of gas-works risks, to the improved character of gas engineering, or to the command of preventive and remedial appliances which the modern gas manager, as a rule, fully appreciates; the fact is one upon which the industry and the community are to be congratulated. As regards the mishandling of gas by consumers and the outside public generally, it is to be feared that the idiot who blows out the gas, or searches for a leak of gas with a light, is as ineradicable as the imbecile who thinks it funny to point a gun at somebody without knowing or caring if it is loaded or not. A sharp example should be made of these individuals when caught. It is worthy of remark in this connection that nothing more has been done in the way of prescribing the limit of carbonic oxide as an ingredient of town's gas. Oddly enough, a long-continued disturbance of the streets of London, caused by electric cable-laying operations, has induced a revival of the proposal to put all gas-mains into subways, which would not necessarily make for public safety.

Altogether, after compiling this retrospect, we are able to consciously testify that the New Century has started with the gas industry in a very strong and promising condition. No one can glance backward through the columns of the "JOURNAL" for 1901 without being struck with the numerous proofs herein preserved of the advance of gas engineering in scope, grasp, and efficiency. Repeated evidences have been given of the splendid progress that is being made by gas engineers of all nations in the scientific adaptation of means to ends in gas manufacture and distribution. The reproach of unintelligent and reactionary working does not

attach to the designers of the great establishments, with all their mechanical equipment for the saving of labour, which it has been our privilege and duty to describe and illustrate during the past year. Nor has the last word been said in any department of gas engineering activity. Greater novelties, bigger developments still are in preparation, unless we sadly misread the signs of the times; and we can promise our readers that when these things arise they will be faithfully recorded in the "JOURNAL."

WATER AFFAIRS.

The Principal Events of the Year.

THE completion of the first stage of the journey into the new century, affords a convenient opportunity for taking a backward glance over the road travelled, and noting some of the more important incidents which have occurred in our progress. It must be acknowledged, at the outset, that the year which closes to-day has not been a particularly eventful one as far as water supply is concerned; but this is only to be expected from the nature of the service. There is not much room for innovation in the general arrangement of works and plant; while on the administrative side the only change possible is the transfer of water undertakings to local bodies or to combinations thereof. At the same time the past twelve months have been by no means barren of events of considerable interest to those who are engaged in providing a supply of water; and these we will endeavour briefly to review.

Probably the most striking feature of the year, which, curiously enough, opened with severe floods in the Midlands, was the great drought with which Manchester and a number of other important towns in the North of England, and even in Scotland, were visited. So serious was the position in the Lancashire city, that curtailment of the supply had to be resorted to on the 21st of July, and the full service could not be resumed until the 22nd of November—a long period of intense anxiety for all concerned. The stock of water was at its lowest on the 9th of the latter month, when there was only eighteen days' supply available. But the old saying that when things come to the worst they mend, was verified in this case; for the much-desired rain came on the following Monday—not, as we wrote at the time, in a mere shower, but in "a veritable deluge." That this language was not exaggerated will be apparent from the fact that from the 9th to the 20th of November the store of water at Longdendale was increased from 515 to 2444 million gallons. Two days later, all restrictions were removed, and a constant supply was once more afforded. The drought taught the authorities a severe lesson, from which they were not slow to profit. Rather more than a year ago, the first length of a second pipe-line from Thirlmere was laid; and the straits to which the city had been put led to the work being accelerated by the Water Committee, who were criticized for not, while they were about it, arranging for a third line. However, it may be hoped that the auxiliary conduit in hand will be finished before the city is again visited with an exceptionally long spell of dry weather. Birmingham was not so badly off for water, as the Water Committee, in the spring, entered into an arrangement with the East Worcestershire Water Company, under which the surplus yield of a new well near Bromsgrove, estimated at 500,000 gallons a day, was made available. The unusual spectacle was thus presented of a Water Company helping a Corporation to keep up the supply. With regard to the other towns affected (Huddersfield being one of the worst sufferers), the effects of the drought were recorded in our columns during its prevalence, and need not be repeated here. They brought forcibly home to those who are responsible for maintaining an adequate service of water in the towns in question—in which, for the most part, the water-works are in the hands of the Municipalities—the necessity for the provision of adequate storage; while the consumers had impressed upon them, by painful experience, the duty of using, and not wasting, the water placed at their disposal with so much labour and expense. It only remains to record, in connection with this subject, that during the whole period of the drought the consumers in the Metropolis received an uninterrupted supply of water—a fact upon which the Directors of the Water Companies are fully justified in congratulating themselves.

Reference to the London Water Companies naturally leads to a review of the progress of the Metropolitan Water Question during the year. The London County Council duly presented the Bill of which they had given notice for purchasing the Companies' undertakings; and a few days before the date fixed for its second reading, a deputation from the Council waited upon the President of the Local Government Board (Mr. Walter Long), and coolly asked him to afford facilities for its progress, on the ground that the Council, at their recent election, had received a "man-"date" from the people on the Water Question. Mr. Long politely told them he should do nothing of the sort. Accordingly, when the Bill came up for its second reading, it was rejected by a majority of 77. During the debate, Mr. Long made the important announcement that the Government recognized the existence of a general agreement among the public as to the necessity for purchase, and that he was actually preparing a Bill to effect this object, which he hoped would be successful. Notwithstanding this promise that the Government intended to take the matter in hand, Mr. Burns lost no time in publicly announcing that the County Council intended to prepare their rejected Bill for introduction in the session of 1902. Our readers are aware that they have kept their promise; and so has Mr. Long. The measure emanating from Spring Gardens is what was expected; that of the Government, however, judging by the terms of the notice given for it, has already aroused the hostility of the Water Companies, and it will in all probability encounter strong opposition from them. The scope of the two Bills has been so recently indicated, that further reference to them is not called for.

It may be convenient to refer here to the circumstances which led the County Council to go with such confidence to Mr. Long, on the ground that they had received a "man-"date" from the London electorate on the Water Question. Towards the close of last year, the Water Companies, in compliance with the suggestion of Lord Llandaff's Commission, submitted to the Local Government Board a revised set of regulations applicable to consumers' fittings; and the Board ordered an inquiry to be held in regard thereto. It was opened by the Official Water Examiner (Mr. Chas. Perrin, M.Inst.C.E.), who had the assistance of Dr. Thompson and Mr. Fawcett, on the 11th of February. But the Companies' proposals raised such a storm of public indignation, which was rendered more violent than it would probably have been by the efforts of a certain section of the Press, that it was decided to withdraw them. However, the excitement over this matter, occurring, as it did, just about the time of the election of a new County Council, had the effect of sending the Progressive party back to Spring Gardens with a considerable accession of strength. They were naturally very jubilant over their victory, which was, in reality, due mainly to the faulty tactics of their opponents. The election was fought upon party political lines, with the result that the Moderates estranged numbers of their old supporters.

Though the past session was not productive of anything very striking in the way of water legislation, it presented several interesting features. Foiled over their Purchase Bill, the London County Council scored a success in passing a measure to extend till 1906 the operation of the "steriliza-"tion" clause; and in the closing days of the session, Sir Blundle Maple managed to introduce a Bill to authorize the formation of a Water Council for London. It did not, however, get beyond its first reading. Outside the Metropolis, the constitution of Water Boards was sanctioned for Biggleswade, Aspatria and Holme Cultram, Ilkeston and Heanor, and Southport and the district. The application in regard to Ilkeston led to a decision by a Select Committee that the water proposed to be taken was "water flowing in a defined "channel." Purchases of local water-works were authorized in the cases of Aldeburgh, Broadstairs, Llandrindod Wells, Prestatyn, and Wells; but the Corporations of the Hartlepools failed to get possession of the undertaking of the Hartlepool Gas and Water Company. The South Essex Water Company, after two unsuccessful applications, obtained sanction to enlarge their area. The Rickmansworth and Uxbridge Valley Company and the Wolverhampton Corporation failed to get authority for so doing. The objects of the various Acts passed last session in relation to water supply have been so recently indicated in our columns as to render further reference needless. A few incidents of the session, however, call for brief notice. It has been already mentioned that the opponents of the Wolverhampton Corporation Water Bill were successful in getting it rejected. But they did more than this; for one of them was the means

of having a new Standing Order framed, giving *locus standi* before the Lower House to parties prejudicially affected by the abstraction of underground water. An instructive incident occurred in connection with the proceedings on the Leeds Corporation Water Bill, where a Rivers Board who had been refused *locus* in the Lords tried to get it in the Commons by petitioning as a County Council—a bit of sharp practice in which they signally failed. Noteworthy features of the session were the granting to the Tees Water Board, notwithstanding much opposition, of power to sell surplus water in bulk to local bodies and others; and the refusal, on rather sentimental grounds, of a railway constituting an important detail in the Bill being promoted by the Derwent Valley Water Board.

The year now closing has not been wanting in interesting events in the realm of law. First in point of time was the complaint lodged by the Vestry of St. Mary, Battersea, before the Railway and Canal Commissioners, under the provisions of the Metropolis Water Act, 1897, against the Southwark and Vauxhall and Lambeth Water Companies, in regard to the quality of their supplies. These were the first proceedings taken under the Act; and they occupied the Commissioners, with the assistance of Mr. Justice Wright, for two days towards the end of January. The case of the Southwark and Vauxhall Company was first considered; and it drew from his Lordship a judgment so unmistakably in their favour, that the other Company were not called upon to defend themselves. Once more, therefore, it was proved that the Metropolitan Water Supply is not so bad as it is made out to be. At Bradford, an interesting test-case in regard to charging for water used in extinguishing fire was heard by the Stipendiary (Mr. C. Skidmore). Water was taken from the hydrants on certain premises supplied by meter, to assist in putting out a fire thereon; and the Corporation sent in a demand for payment for the whole of the water registered. The defendants resisted the claim for the water used by the Fire Brigade, and tendered an amount based on their average consumption; and the Magistrate decided that they were justified in so doing. An injunction was granted to restrain the Tunbridge Wells Gas Company from polluting a water supply by allowing gas to escape from their mains. Early in the year, some plumbers at Sheffield, and recently one at Bristol, were fined for connecting water-pipes without due authorization. The consumption of domestic water for trade purposes by a baker and his assistant gave rise to some interesting proceedings at Thornbury. The Magistrates refused to convict; but their decision was reversed on appeal to the High Court. The question of trade and domestic supplies of water was raised in two important cases. In one, which arose at Barnard Castle, a swimming-bath in an industrial school was included in the latter category, as was also a boarding-house at Great Yarmouth which the local Water Company sought to charge on the trade scale. At Wilmslow, an amateur photographer was successful in resisting a claim by the Stockport Corporation for 10s. for water used for developing.

At Barnet, a dispute between the Barnet District Gas and Water Company and the Finchley District Council as to the price to be paid by the latter for water used for public purposes, resulted in the charge being reduced by the Justices by 1d. per 1000 gallons. Another dispute, in which a consumer of the West Middlesex Water Company questioned the assessment of his house at Cricklewood, was decided in the Company's favour. A difference of opinion which had arisen between the three Companies constituting the Staines Reservoirs Joint Committee, as to the payment of interest on the debenture stock and of certain management expenses, was referred to Mr. Justice Buckley, who determined that they ought not to come out of capital, but that each Company should be liable for one-third. Several important assessment appeals have been reported in our columns during the year—not the least interesting being one by the New River Company against the rating of their intake on the River Lea. It was contended, in support of the assessment, that beyond the rating of the intake at its structural value and its value as land, it should be rated in an additional sum in respect of an enhanced value acquired by it as being the medium by which the water of the river was conveyed into the Company's channel. The appeal was allowed, with costs. The rating of the large reservoir of the Plymouth Corporation was the subject of a successful appeal by that body; and the site of a disused reservoir gave trouble to the East London Water Company, who had to resist an unjust claim made in respect of it by the Overseers of St. Mary, Stratford. The general question of the assessment of reservoirs, which was taken up some months ago by an Association formed to secure equitable rating, came up on several occasions during the year; but, so far, the agitation has not borne very much fruit.

Though the year has not been notable for the completion of any great scheme, works have been brought into use and others begun which are destined to play an important part in connection with the supply of water in the future. On the last day of April, a formal commencement was made with two large reservoirs, having a combined capacity of 1076 million gallons, for the Southwark and Vauxhall Water Company, at Walton-on-Thames. The same day, six additional filter-beds, recently completed, were brought into use. Those who were invited to take part in the ceremony had an opportunity of inspecting the very fine set of pumping engines which the Company had installed in the new house at their Hampton station. Higher up the river, the Staines reservoirs scheme, under the supervision of Messrs. Hunter and Middleton, is gradually approaching completion. Although, strictly speaking, an event which occurred in the closing days of last December, it may not be out of place to allude here to the cutting by Lord Derby of the first turf of a new reservoir, capable of holding 110 million gallons of water, at Prescot, for the Liverpool Corporation, inasmuch as the actual work was commenced in the present year. While referring to Liverpool, it may be mentioned that the Corporation have recently completed an arrangement for furnishing Wallasey with a supply of Vyrnwy water, at a capital outlay of about £150,000. The great works which are being carried out by Mr. James Mansergh for the supply of Birmingham with water from Wales have made good progress; but the Water Committee have found it necessary to apply for an extension of time for their completion, as well as for authority to lay down additional lines of pipes. The capital expenditure on this scheme up to the close of the last financial year was £3,456,921. The works which are being constructed in the Little Don Valley for the supply of Sheffield, under the supervision of Mr. W. Terrey, the General Manager of the Corporation Water Department, have been pushed on with all practicable speed. Something like £402,000 has been laid out upon them since they were commenced rather more than four years ago. An undertaking in which Sheffield is largely interested—the Derwent Valley water scheme—was commenced in the summer; the event being celebrated by a dinner given by Alderman Gainsford, Chairman of the Water Board, to the representatives of the constituent authorities. In June, the supply of water to Glasgow was increased by the opening of a new aqueduct which had been in course of construction for fifteen years; while early in October the first instalment of the Mourne extension scheme for the supply of Belfast was brought into use.

The literature of water supply has received some useful additions through the medium of technical societies. Early in the year, a long discussion—interrupted by the calamity which the nation suffered towards the close of January—took place at the Surveyors' Institution, on the paper read a few weeks before by Mr. R. E. Middleton, M.Inst.C.E., on "The Future of the London Water Supply." The author laid down the proposition that there is sufficient water in the neighbourhood of London to satisfy the requirements of any population which may reasonably be expected to be congregated within the Metropolis, and that consequently there is no need to go to Wales for an auxiliary supply; and it certainly was not controverted. The members of the British Association of Water-Works Engineers had an excellent programme prepared by their Council for the sixth annual meeting at Birkenhead in July. Unfortunately, however, the proceedings were marred by two unforeseen circumstances. The President—Mr. W. A. Richardson, M.Inst.C.E., the Corporation Water Engineer—was very much out of health, and could not read the short address he had prepared; and the technical business, which was of a highly interesting character, was abruptly brought to a close by the disastrous fire which occurred at the Town Hall on the occasion of the annual dinner of the Association on the evening of the second day. The subjects left over were dealt with at the winter meeting, held in London on the 7th inst., over which the Senior Vice-President (Mr. F. Griffith, of Leicester) presided, in the absence through illness of Mr. Richardson. Good discussions took place on the relative merits of open and covered service reservoirs

and of English, French, and American practice in the manufacture of cast-iron pipes. The outcome of the latter was a suggestion, put forward by Mr. W. Ingham, of Torquay, that a Committee should be formed to take into consideration the question of the standardization of cast-iron pipes; and the matter is under the consideration of the Council. The Conference on Water Supplies and River Pollution, organized by the Council of the Sanitary Institute, in October, allowed of the consideration of matters of much importance to the community, by parties who would not be likely to be brought together by any other means. The papers submitted were almost too numerous for the time (two mornings) available; but by distributing prints of them in advance, and discussing them in groups, the long programme was gone through. It was expected that Sir Alexander Binnie would preside on the first day; but he was prevented from doing so by a severe bereavement, and Professor Henry Robinson took his place. On the second day, the chair was occupied by Mr. W. Whitaker, F.R.S. The fifteen papers, with the discussions thereon, constitute a valuable addition to the "Transactions" of the Institute. On the afternoons of the two days of the Conference, the delegates visited the water-fittings testing-shops of the New River Company in Clerkenwell, the Lea Bridge works of the East London Water Company, and the Staines reservoirs works. In connection with the Conference, there was an exhibition of sanitary appliances. The session of the Institution of Civil Engineers opened in November under the presidency of Mr. Charles Hawksley, who took the position which would have been filled by Sir William White, had not illness, which unhappily proved fatal, prevented it. Thus two eminent Water Engineers—one being Mr. James Mansergh, and the other bearing a name which has for many years been upon the roll of the Institution—succeeded each other in the chair. Mr. Hawksley's address was a comprehensive review of engineering progress during the past century. One section of it consisted of an interesting account of the development of water supply; and it naturally contained a reference to the introduction of the constant service by the author's father as long ago as 1830, when he was only 23 years of age. The President emphasized the necessity for having adequate regulations for preventing waste, and counselled united action to check any interference by a Government Department which would tend to render them inefficient, or be in any way detrimental to a system which has proved to be so beneficial to the community. In another section of the address, Mr. Hawksley dealt with sewerage and sewage disposal.

Although during the year the water-works in certain towns passed into the hands of local bodies, evidence was not wanting that the desire for the municipalization of such undertakings is not quite so keen as it was. At Bristol and at Portsmouth, purchase schemes were rejected after prolonged consideration; while a proposal that the Corporation of Louth should acquire the property of the local Water Company was rejected with enthusiasm. At Cromer, however, the District Council went so far as to obtain the insertion of a purchase clause in the Water Company's Act last session. A number of arbitrations were held in the course of the year; several being in connection with the purchase of land for the protection of sources of water supply. The location of springs by the aid of the divining-rod was effected in several cases; but in one the "dowser" was unsuccessful, and was sued for breach of contract. Even when a source of water has been found, and the yield of a boring is ample, the quality may prove unsuitable. This was, unfortunately, the case at Scunthorpe, where, after two years' operations, the water was found to be too hard for domestic purposes and too saline for drinking. Another mishap was the discovery of a very extensive leak in the Butterley reservoir of the Huddersfield Corporation; while, consequent on a serious difference between the estimates and the tenders submitted for the first section of their Geltsdale scheme, the Carlisle Corporation decided to let it remain in abeyance for six months. The "friction" which had arisen over this matter between the Special Water Committee and the Engineer (Mr. C. B. Newton) led to the Corporation dispensing with his services, as well as those of Mr. E. M. Eaton, who had been associated with him as consultant. The Swansea Corporation had further trouble with the Contractors for a reservoir; and the Merthyr District Council got into a dispute with theirs, in respect of work at the Neuadd Water-Works. The former was settled by the High Court, and the latter by Mr. G. F. Deacon. Some inconvenience was caused at Sheffield by a strike of plumbers. The questions of the electrolysis of mains and the disturbance of streets for laying them came prominently forward; but, beyond a demand for the construction of subways, their discussion did not lead to any result. Though a good deal of construction and extension work was carried out in the course of the year, happily no very serious fatality has to be recorded.

The year has not passed without the occurrence of a few official and other changes which call for notice. First in importance, perhaps, is the relinquishment by Sir Alexander Binnie of the position of Chief Engineer to the London County Council, which takes effect from to day. Into the reasons for this step it is not our business to enter. We merely place the fact on record; adding that Sir Alexander is succeeded by Mr. Maurice Fitzmaurice, lately Chief Engineer of the Assouan reservoir which is being constructed by Sir John Aird's firm for the Egyptian Government. Reference to this well-known contractor affords an opportunity of mentioning that his baronetcy was one of the New Year honours. After a service of 51 years with the Norwich Water Company, for 44 of which he held the position of Manager, Mr. John Ayris, M.Inst.C.E., early in the year retired from active duty, and was succeeded by Mr. Parr. Mr. W. A. Richardson, the Water Engineer of the Birkenhead Corporation, whose ill-health has already been referred to, felt called upon, on this account, to send in his resignation; and Mr. J. A. Paskin, who held a similar position at Halifax, has done likewise. Mr. H. Haselden relinquished at the end of June the position of Secretary of the South Staffordshire Water-Works Company, which he had held for 38 years, and was succeeded by Mr. G. J. Sparrow. Mr. C. B. Newton has left the service of the Carlisle Corporation under circumstances already noticed. Death has not been very busy among water engineers during the year; but some losses have to be recorded. In March, the Chelsea Water Company lost their Engineer, Mr. Richard Hack, M.Inst.C.E., brother to Mr. Henry Hack, of Saltley, Birmingham. In April, the death occurred of Mr. W. Santo Crimp, M.Inst.C.E., a well-known water and sewerage engineer. Towards the end of May, Major Lamorock Flower, the Sanitary Engineer of the Lea Conservancy Board, who for half-a-century had been a consistent advocate of the formation of Water Boards for the supervision of watershed areas, passed away; and in August it was our painful duty to notify the decease of Mr. A. W. Gadesden, who was for some years Chairman of the East London Water Company. Mr. A. H. Smee, M.R.C.S., whose contributions on water supply and disease had occasionally appeared in our columns, died rather suddenly early in November; and Mr. R. A. F. A. Coyne, who for 25 years was an official of the Edinburgh and District Water Trust, not many days later.

In bringing to a close this survey of the principal events of the year, so far as the supply of water is concerned, it only remains to express the hope that whatever lessons they teach may be readily applied in rendering more efficient this important public service. Reforms are needed in many respects; and evidence is not wanting of the existence of a desire that the year upon which we are entering shall not close without an attempt, at all events, being made to carry them into effect.

An arrangement has been made whereby the gas-lamps in the streets of Berlin will be lighted automatically and simultaneously by means of an electric attachment. The current will be switched on from the central station, and a spark will ignite the gas, which will be turned on by special apparatus.

According to a statement reported to have been made by Mr. Alexander Reid, Assoc.M.Inst.C.E., who was at one time favourably impressed with the Kent coal scheme, there are in the province of Shan-si, in China, coalfields large enough to keep the world supplied for the next 2000 years. Mr. Reid thinks that the "Heathen Chinee" is sufficiently cute to join hands with the right man who comes along with the right machinery.

The employees of Messrs. Fletcher, Russell and Co., Limited, will remember with pleasure the week ending Dec. 21. Through the generosity of the head of the firm—Mr. Thomas Fletcher—the substantial sum of £1000 was, at the end of the week, distributed among them; and, in addition to a share of the money, each employee received a photograph of the donor with his autograph appended. Needless to say, Mr. Fletcher's liberality was highly appreciated; but apart from this tangible evidence of his kindness, we have every confidence in saying that Mr. Fletcher's photograph will receive an honoured place in the household of every recipient.

ESSAYS AND REVIEWS.

AFTER FOURTEEN MONTHS.

Our readers have now had the report of the Welsbach Advisory Committee in their possession for fully a week; and those who have taken the trouble to read it can only have finished doing so with the one conclusion that the Committee have (to use a trite phrase) justified the confidence reposed in them at the last annual meeting of the shareholders, and that they have done their work right well, without fear and without favour. Never before has there been an examination called for into the affairs of a concern, part of or adjunctive to, the great gas industry which has of necessity been so penetrating and finally so damnatory in the recital of the result. And yet there is nothing in the report that those who have interested themselves in the Welsbach Company, and who have not been either absolutely or obstinately blind, have not seen or known before. But when the Committee were appointed we hardly anticipated that the whole of the facts involved would be dragged to the light of day in the cold, fearless, conglomerate, and, we imagine, unanswerable manner in which they have been by the half-a-dozen keen men of business and of public affairs who constituted the Committee. But it will be a relief to the shareholders now that the worst is really known. The report is pitted with charges of mismanagement in the past and the present; and, this being so, it is satisfactory to know that every deed of the Committee and every word written by them have the legal endorsement of one of the foremost of City Company Solicitors. Verily the document must have formed an indigestible Christmas dish both for those responsible for the conduct of the concern, and for those who have heavily sunk capital and savings in it. For the latter, one cannot avoid feeling some commiseration; and from certain gentlemen connected with the direction of the Company, it is impossible to withhold a little sympathy. But, in our representative capacity in connection with the gas industry, such feelings must give place to others of satisfaction that, if the Committee's discriminate work and sound advice are accepted by the shareholders, the gas industry cannot fail to be hugely benefited, and the greater the extent of the benefit, the greater will be the advantage which will accrue to the disprofited proprietors.

We are refraining at present from all reference to Welsbach litigation and patents; in those respects we are quite content to let the report stand without comment. Then in regard to capital and other monetary matters, most of the constant readers of the "Journal" know as much as we do ourselves about the frequent shuffling of the financial cards of the concern which has produced the present inflated capital; but if there are any who are at all deficient in knowledge in this connection, they will find that the position is succinctly summed up in the Committee's report. That position, too extensive by far to ever receive an adequate covering dividend, has been rendered the more impossible of an even slender commercial success by what the report assures us are speculations of an order which can only be described as wanton in the extreme. But it is upon that financial position, however it may have been produced, that the price of Welsbach mantles depends—in other words, it is the financial position occupied by the Company to-day that makes impossible the selling of their mantles at a price which will stand the assaults of competition—legitimate or otherwise—and which prevents the bringing of their mantles down to the level of an article of common use in every household. If the position can be reversed, profit may yet accrue to the shareholders. But if a sufficient section of the Company insists in holding it, then the report says, as clearly as anything has ever been said, that all interested in the success of the Company may at once abandon hope. Only a few more years have to roll to bring us to the time when any claim which the Company may at present have in regard to a legal monopoly will naturally perish, and then it may be too late to raise new life out of the (we venture to think it will be) exhausted residuum of what, under different circumstances, might have been a prosperous undertaking. Competition there must be. It will then be rife throughout the whole country; and, instead of occupying an impregnable situation to meet it, the Welsbach Company will, through its capital encumbrance, be nothing more than an immobile party in the fray. From such a position there could then only be for them one exit. Therefore, we hold, to maintain the conditions of to-day will only mean ruin for the whole concern; and so we earnestly hope the Committee's proposals will be accepted by the shareholders with unanimity.

In the Committee's report, we have a full vindication for the line we took up fourteen months ago in dealing with the Welsbach Company's affairs. The Committee advocate, among many other things, a reduction of capital, a further lowering of the price of mantles, and the cultivation of a more intimate relationship with the gas industry. With these recommendations before us—recommendations the result of a minute, comprehensive, and patient investigation—it is interesting to re-read our first article on "Incandescent Gas-Mantle Competition" in the "Journal" for Oct. 30, 1900. Here is an extract from it:

> Our attitude towards the Company ought certainly to be clearly known by this time; and we can declare it in a few words: With their past financial arrangements we have little concern, excepting in so far as they have operated detrimentally on the price of their mantles, and have dragged upon the heels of progress; with the Directors' policy and business methods before (say) about the time of the advent of the Kern burner, we were not particularly struck; but the more enlightened methods and commercial principles upon which the business is now being conducted have our full sympathy. But even this sympathy will not hush our cry for the cheapest and best that can be obtained in incandescent mantles to benefit the gas industry of this country. We care not whether the cheap, serviceable mantle comes from the west or from the east so long as incandescent lighting obtains the same hold of the public in this country that it has obtained in Germany through the medium of the low-priced mantle. The Welsbach Company themselves tell us that, since their recent substantial reduction in the price of mantles and burners, the demand has increased by 50 per cent. This is satisfactory; and it points the direction in which they must, and sooner or later will have to, further tread. The question of the relation of profits to the heavy capital with which the present administration is encumbered is a serious one for them; but in it the public, the gas industry, or the "Journal" have no concern whatever. The public want incandescent lighting; and the gas industry desires to push it.

These views we held and published long before the appointment of the Committee was ever thought of; and therefore it is indeed a satisfaction to find that they are so completely in agreement with those held by the Committee.

To take the question of the price of mantles first. The gas industry presents a big field for incandescent gas-lighting enterprise; but as yet only the surface of that field has been opened up. The Welsbach Company's sales of mantles last year after the reduction in price from the absurd figure of 1s. showed a tremendous rise; and this year the increase will, we believe, be even greater. This is proof of the existence of the field. But there is the large solid substratum of the smaller customers of the gas industry not yet touched. Cheaper mantles must be had for them, as well as for the retention of the users in the higher levels, who regard themselves as grievously wronged in having to pay 7½d. to replace every broken or exhausted mantle in comparison with the 3d. or 4d. paid by friends. The feeling will grow. The question then arises, Are the Welsbach Company the proper people to undertake the exploitation of the still great unexplored field which the gas lighting industry offers? We say, and say distinctly, that, under present conditions, they are not. Under the Advisory Committee's conditions, we say just as emphatically that the Company will be; and, for what it is worth as a channel of communication with the gas industry, we would give the re-organized Company every aid they could fairly claim, as we ever do in the case of other enterprises which subserve the gas industry.

We have used the words "under present conditions;" and the report supports us. But it is only fair we should give our reasons. With their present capital, the Company cannot, with any hope of profit, reduce their prices. There must also be a limitation to their productive capacity; and, with the prices of their stock and shares at the present figures, they cannot command more capital to meet the big demand which awaits the coming of a cheaper mantle, in which there can be free trading. If they continue their sales at the present rate of increase and at the prevailing price, then any profits made must of necessity be absorbed to provide the requisite machinery for meeting the enlarged sales. Will those who have already subscribed 3½ millions of capital consent to this? We think not; and therefore the Company as at present circumstanced are not in any way fitted for dealing efficiently with the incandescent gas lighting enterprise in this country. Altogether, there is not a ray of light penetrating the gloom encircling the Company to-day; and the only course for the proprietors is to accept the situation, and the prudent and serious advice their own Advisory Committee offer them.

We are extremely glad to see the Committee's recognition of the necessity for the cultivation of a closer association with the gas industry. Theirs are the words of the wise in this regard; and no doubt Mr. George Livesey's testimony has helped them to a proper understanding in this direction. It is undeniable that there has been an undefined division between the Company and the gas industry; and yet the interests of the two meet on common ground. The consanguinity, however, has not been sufficiently recognized by one side or the other. But for the gas industry we are in a position to assert clearly that, for any estrangement that exists, the fault is not theirs; and the Company must look for it at home. In every manner possible, the gas industry has striven their utmost to flood the land and its homes with incandescent gas-light; but have they met with adequate and proper consideration in that work from the Welsbach Company? The Company have, report says, exercised to the full its autocratic power; and complaint has come to our ears to that effect from gas officials in the North, South, East, and West. But we need not go into these matters. Under the suggested new conditions, however, we are free to pledge the gas industry to a liberal response to any serious advances by the Company which have for their object mutual advantage. The gas industry can, so far as human eye can see, permanently establish incandescent gas lighting, and carry it where the incandescent mantle vendor cannot. And the providers of incandescent mantles can do their part in that work by furnishing the cheap mantle. One can benefit the other largely and permanently. We reiterate then our pleasure at finding the Advisory Committee have recognized the necessity for early cultivating amicable relations with the gas industry.

It will be noticed that we have refrained from reference to personal matters here. Those are best left for discussion by the shareholders. In making the comments we have done, we have

not lost sight of the fact that the report is—regarding the Committee and the Directors as being for the moment opponents—an *ex parte* statement. But we cannot close our eyes to facts which are certified by the names of half-a-dozen gentlemen of repute, with the Hon. Philip Stanhope at their head. The question of uppermost interest now is, what will the Directors do? Sir Henry Burdett is not the man to shirk facing the shareholders with a reply in defence of his own and his colleagues' policy, or of making, if necessary, an acknowledgment of mistakes in management or of incompetence to deal with a business of this special character. Anyway the Directors are in the difficult position that they themselves were in large measure responsible for the creation of the Committee, who stand therefore somewhat in the position of arbiters between the shareholders and the Board. So far as we can ascertain at the time of going to press, the Directors have not yet made a move, either in the issue of a reply or in the way of calling a meeting; but the report is so full of accusation and condemnation that time must, of course, be given them for full consideration. Whenever they do speak, what they say will be perused with more than ordinary curiosity. The shareholders wanted a strong Committee and thorough investigation to put the concern on the right road; they have had both.

THE DECAY OF APPRENTICESHIP—A REMEDY SUGGESTED.

THE subject of commercial and technical education has been worn pretty well threadbare, so far as theory is concerned. Everybody agrees, in a general sort of way, that a proper system of special education for those intending to earn their livelihood by working in a business or at a trade is vital to the nation's prosperity. Technical institutes of various descriptions have been opened in many places, with a considerable flourish of trumpets and much platitudinous speech-making; prizes are distributed annually by a local magnate or even a Cabinet Minister (more platitudes); and the people who have been stirred into taking a mild interest in the matter, flatter themselves that all is well and that our industrial future is assured beyond possible question. Yet there is often little ground for such satisfaction with what has been done. For these reasons: That too few students avail themselves of the opportunities afforded, and that, of those who do, a very considerable proportion do not belong to the class of workers whom it is desired should receive the instruction that is offered.

It is a matter of common knowledge that the old system of apprenticeship is practically defunct. This is due partly to the conditions of modern industrial life, and partly to the hostility of the Trade Unions. To repair this damage to our methods of producing efficient and intelligent workers, we are bidden turn to technical education. If, then, it is to the technical institutes that we are to look for the training of the beginners in the industrial world, it is of the first importance that these beginners should constitute the bulk of the students at the institutions; that the bulk of the beginners should be students there; and that they should have adequate opportunities for following the courses of instruction provided. Unfortunately, none of these required conditions are, in fact, generally fulfilled. That this is so, is shown very clearly, by means of statistics which we do not propose to quote, by Professor Rawson in an article entitled "The Nation, the Apprentice, and the Polytechnic," published in a recent issue of the "Contemporary Review." What we are most desirous of noticing is Professor Rawson's discussion of the causes of the present unsatisfactory state of affairs, and the remedies for it which he proposes. His article is one of the most valuable, because one of the most practical, of the numberless effusions upon the subject of technical education, that we have read.

The causes of the present failure of our technical institutions to fulfil their prime object are given by Professor Rawson as: "(1) The want of all co-ordination in our educational system; (2) the neglect on the part of the State to cause the employer to recognize his responsibilities towards his youthful hands (for, in the old sense of the word, we cannot call them apprentices); and (3), the finished apathy or ignorance of the parent, or, if this be absent, it may be replaced—of course, with many exceptions—by his need or his rapacity." As to the lack of system in matters educational in this country, it is not necessary to say much. The thing is too patent. School boards and voluntary schools struggling one against the other, often on religious or political rather than educational grounds; higher-grade board schools, grammar schools, technical institutes, schools of science, all grabbing for students of the same age, and offering similar courses of instruction; all these working at hap-hazard and often over-lapping—to speak of a "system of education" is in the circumstances absurd.

The indifference of parents on the subject is remarkable, and can only be ascribed to some national peculiarity. Englishmen are not, as a race, "keen on" education. It is looked upon rather as an unpleasant necessity to be got through as soon as may be than as a matter of the utmost importance, the efficiency or inefficiency of which will have a deep and lasting influence upon the life's career. As a nation, we have done so well hitherto, without troubling ourselves greatly about education, that as yet, although the increasing part played by science in industrial matters materially discounts the advantages accruing from our unique natural resources, we have not fully appreciated the commercial importance of education. As a consequence of this, the value of education is not, very often, fully comprehended by employers. How many take any care to see that the young hands have adequate opportunities for acquiring the scientific and theoretical knowledge that is the necessary basis in many industries—and in none more than that of gas making—upon which to build practical experience, and without which practical experience loses one-half of its value? If a young fellow is kept hard at it for eight or ten hours every day at the works, can he be expected to devote the remaining waking hours to evening classes? If he be willing to do so, is he not pretty sure to suffer physical deterioration from such incessant application—is he able to benefit fully by the instruction he receives? It does not require a lengthy acquaintance with the evening students at some of our polytechnics to discover that many of them attend the classes rather by way of passing the time, or of amusement or hobby-riding, than with a definite and serious purpose in view.

By what practicable means is the present state of affairs to be remedied? The following is a summary of Professor Rawson's proposals. The primary requisition is a duly co-ordinated scheme, under which a boy would pass by pre-arranged gradations from the beginning of elementary education to the final stage of efficiency. The average boy, having completed the sixth standard at the elementary school—which, board or voluntary, should work under the same code of instruction, and that not too diffuse—should go to one of the newly-constituted higher elementary schools, at which the code of general, not specialized, instruction should be uniform. At the age of 14½ years, it is probable that he would—in fact, it is desirable that he should—enter the workshop; being then at an age most suitable to the acquirement of manual dexterity and that intimate familiarity with his work which can be best acquired in early youth, and which, once acquired, is never again entirely lost. But (and this is the vital point), having entered the workshop, his education is not to be considered completed. It is only beginning. Professor's Rawson's suggestion is that for the first two years of his employment the lad should be required, and for that purpose given leave, to attend a technical institute on two afternoons and three evenings every week. He would thus be acquiring theoretical and practical knowledge concurrently, and without any unfair curtailment of his leisure hours. He would have two evenings and the half-day Saturday always for recreation. The boy would not have had time to forget his elementary grounding, which many lads going to evening classes two or three years after entering a works find it necessary to re-learn.

At the end of this two years of combined practical and theoretical instruction, the employer should send to the polytechnic, as full day students, for a period of at least two years, during which time he would pay them their wages, those of his apprentices upon whose work he has, during the first two years of their employment, received favourable reports from both the Technical Institute and from his managers and foremen. By this means, "the bright, steady apprentice, the future man of capacity, will have obtained his chance. For two, perhaps even three, years he receives his wages, as apprentice, while being in enjoyment of the whole day and evening for study. If neglect or misconduct of any kind can be proved against him, then let the employer possess the power of refusing to pay him his weekly wages. Thus full control would be maintained over the most recalcitrant, just as one of the most potent factors in Germany, in compelling individual educational advancement, is the remission of one or more years of military service to those students who have passed certain examinations with credit. The holidays allowed should be, as far as possible, those of the works whence he comes, and not those of the polytechnic; hence, during vacations, he would return to the works, and thus not be removed from, and lose all touch with, his own hive."

Such is Professor Rawson's suggestion. There is much to be said in its favour. The cost to the employer would unquestionably be many-fold repaid by the advantage of having eventually at his disposal a number of picked and thoroughly-trained young men from among whom to choose his future foremen, works clerks, and managers. Let any gas manager think it out for himself. An adequate supply provided him of young, energetic, intelligent fellows possessing sufficient theoretical training to enable them, not merely to obey, but to understand the why and wherefore of their instructions; to comprehend the working of, and therefore possibly improve upon, the processes they are required to superintend; to so understand what is being done as to be able to report upon any peculiar events that may occur in the carrying through of the work, or to act with the wisdom born of knowledge in any sudden emergency. Would not a gas manager willingly pay two years' wages per head for such men?

One objection that occurs to us in considering the suggestion, is the possibility of the young man, at the end of the two years, failing to return to the employer who had paid him during his tuition. But we think there is not much fear of such an abuse of the privilege afforded. Apart from the constraint of common honesty—which, happily, would be a not inconsiderable safeguard—there is the fact that the young man of eighteen or nineteen years would naturally turn to the certain position awaiting him rather than seek a berth elsewhere; for he would have no credentials to present. Moreover, if an employer felt that such safeguards were insufficient, he could easily fix the rate of wage payable during the tuition period at such a figure that he could

afford to set aside a further sum—say, 10 per cent. upon such wages—which he would undertake to pay to the employee after one year of full service.

It is, of course, essential to the success of such a plan that the technical institutes and the polytechnics should be properly equipped and staffed adequately. The instruction given must be highly specialized—individualized, if necessary—so that the student shall learn as fully as possible what he needs to know, and shall not be obliged to learn indifferently half-a-dozen (to him) useless subjects. "Evening elementary classes in science and art, in languages, in shorthand, in dressmaking, and in ambulance work, filled (or partly filled) with wretchedly-trained students—of whom 50 per cent. leave at the end of the first session—instructed by teachers elsewhere engaged in the daytime," such institutions are simply means of wasting money and deluding the public with the idea that they are supplying the known wants of the country. We must have properly organized schools, and employers are the people to see we get them. The general public do not know what kind of training the youthful workers in our industries require. The employers do, or should, know. It is they who should, first, insist upon the provision of the necessary institutions, and then provide those institutions with the raw material to shape.

This is, as we have often urged before, a question that demands the careful attention and the energetic action of the business men, and they are many, in the House of Commons. The Government keep on handling the question and dropping it. But if the business men will only be in earnest, the Government will move readily enough. We commend Professor Rawson's article to the careful consideration of all employers.

THE VIENNA MUNICIPAL GAS-WORKS.

Report of the First Year's Working.

THE Municipal Gas-Works at Vienna, which commenced the supply of gas to the greater part of the city on Nov. 1, 1899, as mentioned in the account of the works which concluded in the last number of the "JOURNAL" (p. 1657), were in full working order by the close of that year. Hence the report of the working for 1900 will be of interest to those who have followed the description of perhaps the largest scheme of gas-works construction ever undertaken at one time. The following is a digest of the official report for 1900.

The amount of gas made was 2,759,600,000 cubic feet, and the amount distributed 2,759,000,000 cubic feet. The greatest make in one day occurred on Dec. 31, and was 12,987,000 cubic feet; the smallest was 3,936,000 cubic feet, on July 21. The maximum consumption was 14,162,000 cubic feet, on Dec. 19; and the minimum was 2,745,100 cubic feet, on Sunday, July 15. The consumption of coal for carbonizing, boiler use, heating, &c., amounted to 263,690 English tons. The make of gas per ton of coal carbonized was given in the carbonizing returns at 9900 cubic feet; but when stock was taken at the end of the year, there was found to be a considerable surplus of coal, which would render the make per ton larger than that named. The yield of coke of all sizes amounted to 70·67 per cent. of the weight of coal carbonized. The tar made during the year weighed 12,406 tons, or 4·719 per cent. of the coal carbonized. There were 6,428,500 gallons of ammoniacal liquor made; and the floating stock was reduced to allow of 6,519,900 gallons being disposed of. This quantity of liquor contained 488 tons of ammonia. Retort carbon to the amount of 214½ tons was sold, and about 5½ tons left in stock at the end of the year. There were 127 purifying vessels charged during the year. One cubic yard of oxide purified 166,000 cubic feet of gas each time it was used, and, by repeated use, up to the end of the year 880,000 cubic feet.

The consumption of gas in the works and offices amounted to 0·67 per cent. of the total output. The gas lost and condensed in the distributing system apparently was as much as 5·63 per cent. of the quantity distributed from the works; but much of this loss was undoubtedly to be attributed to the temperature of the distributing system in the winter being lower than that of the artificially heated station-meter house. Actually in June, when the temperature relations were reversed, more gas appeared to be consumed than was sent out from the works. Moreover, the meters on the consumers' premises were not all read on one day, but during a period of a few days, which invalidated the comparison with the station meter readings on a definite day.

The greatest number of settings in action at one time was 140; and during a short period in December, 1230 retorts were actually in use. The average make of gas per charge was 2048 cubic feet. The settings were for the most part in good working condition at the close of the year, and probably new retorts will be needed in some settings for the first time during the ensuing year.

Determinations were made regularly in the chemical laboratory of the specific gravity of the gas, the percentages of sulphur and carbonic acid in it, and the illuminating power on each of the four sections. The calorific power of the gas was also determined; but it was not possible to keep control of the flame temperature afforded, because the necessary laboratory apparatus had not been obtained at the time. In addition to chemical analyses of the gas, about 100 analyses of lubricating materials were made, as well as analyses of water, oxide of iron, and coal, 445 tests of gas liquor disposed of, and 573 tests of liquor on the works. Further, 2817 sundry tests were made on burners, governors, mantles, &c.

Some additions were made to the works' plant during the year. As the well water had a hardness of 28½°, and consequently caused much deposit in the boiler tubes, a water-softening plant on the Deveaux-Reisert system was installed, capable of dealing with 3300 gallons per hour. A third engine of 200-horse power was provided in the electrical section, as a reserve for working the coal breakers.

The abnormally severe weather of the winter of 1899-1900 caused considerable injury to the slates and glass of the roofs of the different buildings. No less than 16,000 slates were required for repairing the roofs of the retort, condenser, washer, and purifying houses only.

The number of private consumers' gas-meters increased from 59,932 at the beginning to 63,162 at the end of the year. The distributing system was increased by 13¾ miles of mains in order to supply a group of outlying places. The farthest point supplied is now over 12½ miles from the works. All told, 21¼ miles of mains were added to the distributing system during the year; making its total length at the close of the year nearly 360 miles.

The number of public lamps in the municipal area supplied from the works was slightly increased during the year; and a number of flat-flame burners were changed for incandescent burners. At the end of 1900, there were 12,266 incandescent public lamps in use for half the night, and 8632 in use throughout the night; while there were 36 half-night and 154 all-night flat-flame burners in special positions. 77 lanterns had groups of from 3 to 8 incandescent burners. The half-night lamps were estimated to be alight for 1979 hours during the year, and the all-night lamps for 3871¼ hours. The average consumption of mantles per burner per annum was 5·95 in the half-night and 5·74 in the all-night burners, and of chimneys 2·8 in the half-night, and 3·4 in the all-night burners. The mantles lasted for 333 burning hours on half-night, and 673 burning hours on all-night burners; and the chimneys for 696 and 1130 burning hours respectively.

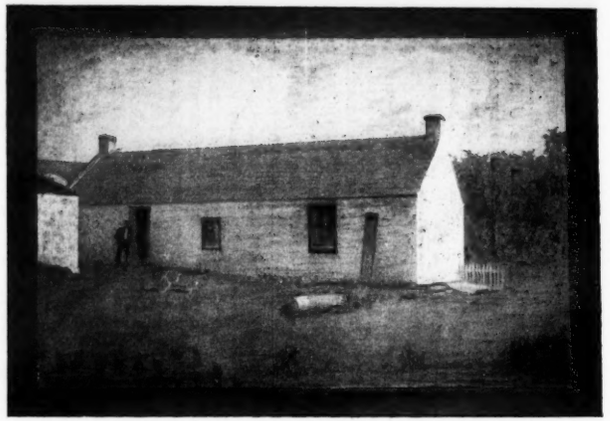
The gas sold to private consumers for lighting purposes in the city and some of the suburbs realized about £467,790; that sold for heating, cooking, and industrial uses, about £33,320; that disposed of for lighting municipal offices, &c., £6405; and that sold for public lighting in two suburbs £276. The value of the gas used for public lighting in the city, at 2s. 10d. per 1000 cubic feet, would amount to £35,077. Meter-rentals produced £19,330. The proceeds of coke and breeze sold amounted to £114,930; while the value of that disposed of to the Municipality was £1528, and of that used about the gas-works £1092. The tar sold fetched £12,430, the ammoniacal liquor £7996, and retort carbon £790. No spent oxide was disposed of during the year. The net profit for the year 1900 was about £142,725.

The Executive Department of the gas-works, in addition to the General Manager, Herr H. Rossner, consisted of a Secretary and 10 officers. The Engineer of the works was Herr F. Kapaun, and he had two chief assistants, two second assistants, 18 officers including draughtsmen, and over 30 others directly under him. The public and private lighting were each under separate departments. The Works' Manager and his two chief assistants had a very numerous staff, including one Chemist and one Resident Surgeon. The greatest number of men employed at the works at one time was 1719, and the lowest 816.

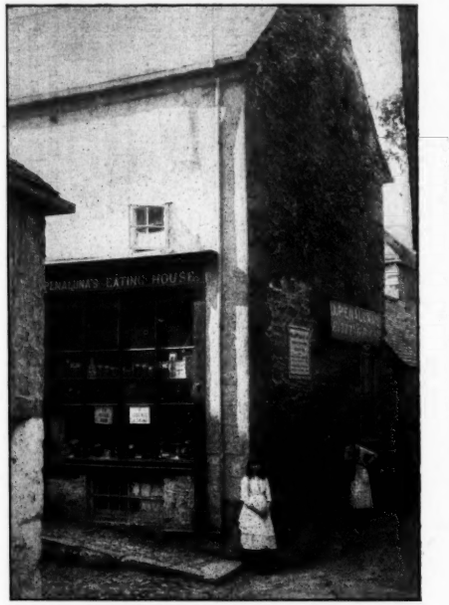
Blast-Furnaces in the United States.—The output of the blast furnaces of the United States last October beat the record. At the commencement of November there were 259 furnaces in blast, with an aggregate weekly productive capacity of 320,824 tons, compared with 201 furnaces, with an aggregate weekly productive capacity of 215,304 tons at the corresponding time in 1900. The stocks of pig sold and unsold in the United States at the commencement of November amounted to 273,251 tons, as compared with 361,593 tons, 380,074 tons, 387,329 tons, 392,598 tons, and 407,723 tons respectively, at the commencement of each of the preceding five months.

Fire Risks of Electricity.—A recent report of the Electrical Bureau of the National Board of Fire Underwriters, in America, contains some curious instances of fires resulting from misdirected electrical currents. In one case, a breakdown in a 250-volt underground cable melted the conduit; the molten metal running down on to an adjacent gas-main, and forming in the shape of a funnel. Electrolysis took place, burning a hole in the main, and allowing the escaping gas to follow the conduit into a vault underneath the sidewalk. An explosion followed, wrecking the vault and sidewalk above; but the evidence does not show whether this explosion resulted from an electric spark or from a candle in the hand of a workman in the basement. In another instance, a short circuit in an underground service generated a gas from the insulating compound used in the tube, which found its way into the basement of a building, in about twelve different places, through cracks in a granite wall. Gas was found burning in all these places; and this caused three slight explosions. Reports of damage by lightning were found to be caused by the entrance of lightning over lighting or signal wires which had not been provided with reliable protective devices; and one was directly traceable to a defective installation of lightning-rods. Five fires reported were due to poor wiring performed by irresponsible and ignorant workmen.

A MEMENTO OF MURDOCH—HIS BIRTHPLACE AND RESIDENCES.



COTTAGE AT BELLOW MILL, LUGAR, AYRSHIRE, IN WHICH WILLIAM MURDOCH WAS BORN, AUG. 21, 1754. (SINCE ENLARGED.)



HOUSE IN REDRUTH, CORNWALL, WHICH HAS A TABLET INSCRIBED BY MESSRS. TANGYE, AS FOLLOWS:

"William Murdoch lived in this house, 1782-1798. Made the first locomotive here, and tested it in 1784. Invented gas lighting, and used it in this house in 1792."

SYCAMORE HOUSE, HANDSWORTH, BIRMINGHAM, IN WHICH WILLIAM MURDOCH DIED, NOV. 15, 1839.

Mr. CHARLES HUNT, the President of the Midland Association of Gas Managers, a few days ago sent to the members a unique, but singularly appropriate, pictorial Christmas card, accompanied by his hearty greetings and best wishes. He has favoured us with the loan of the blocks employed in its production, and we are thereby enabled to give our readers an idea of the character of the card. It will be seen that Mr. Hunt's desire has been to keep fresh in the minds of his colleagues the memory of one who, more than a century ago, helped to lay the foundations of the great industry in which he and they are engaged, and which now occupies so important a position in the affairs of the world.

There was no more fitting time than Christmas to represent some of the places associated with the life and work of this great disseminator of Light. The illustrations tell their own story. From humble beginnings in the cottage at Bellow Mill, William Murdoch, in the course of time, demonstrated to the astonished inhabitants of the little Cornish town of Redruth, and afterwards to the universe at large, the value of a piece of coal as an illuminating agent, and ended his days in the not very palatial establishment at Handsworth. It only remains to say that the view of the cottage at Lugar was taken by one of Mr. Hunt's sons, when he and his father were in the neighbourhood last autumn; and though the photograph did not come out so well as they wished, it is none the less interesting as being, we believe, the first time that Murdoch's birthplace has been actually located. The view of the Redruth house is similar to one given in the "JOURNAL" some short time since; and the house at Handsworth is from a photograph taken by Mr. Spurrier, the Editor of the "Birmingham Magazine." To Mr. Hunt's greetings we cordially add our own for the New Year—to all engaged in the gas industry the world over.

A FAVOURABLE OUTLOOK FOR COAL BUYERS.

THE year ends auspiciously for the coal buyer, and with a satisfactory proof that events will justify the confident expectation expressed in these columns for some time past, that coal will be cheaper in 1902 than in 1901. The collieries have been "trying it on" recently with one of their largest customers—the North Eastern Railway Company, users of something over a million tons a year—and have come off second-best. Such of the contracts as have been settled are, according to usually reliable sources, at prices about 1s. 6d. per ton lower than those paid under the expiring agreements. This is a move in the right direction; and there is not any reason whatever why gas undertakings should not, in the ensuing months, conclude contracts at decidedly more favourable rates than those now current. Considering that the f.o.b. price paid under 1901 contracts by the Metropolitan Gas Companies averaged about 9s., and that in some former years the figure has been between 6s. and 7s., it will be seen that there is ample margin for a further reduction—a margin equal to (say) 3d. per 1000 cubic feet of gas.

Certainly, buyers ought not to be in any hurry to come into the market, unless sellers make it worth their while. January and February may well be let pass before negotiations are opened for the spring contracts—saving, of course, the event of the collieries making overtures worthy of consideration. It is very satisfactory to observe that consumers generally are playing the waiting game. Especially is this so in South Wales—a direct result of the stupid policy of the miners. Collieries have an unusually small number of contracts running, and of them all the majority are only for short periods. Instead of having, as they ordinarily would, orders on their books representing a fair proportion of next year's output, the coalowners have still to sell that output; and they are not likely to do so at prices at all pleasing to themselves.

The labour situation in South Wales develops slowly; but in a manner decidedly interesting to the observer, if not favourable to the miners. The employers are proceeding with the campaign against the Federation, into which they have been forced by the action of the men's leaders, and are extending the scope of their operations, in a fashion very disconcerting to those leaders. In addition to the action for damages instituted in respect of the "stop days" ordered by the men's Executive, the owners (we learn from "The Iron and Coal Trades Review") now propose,

upon Counsel's opinion, to proceed against the South Wales Federation for ordering stoppages of work, lasting in some cases for weeks, at collieries where a few miners had not joined, and would not join, the Federation.

Readers of the "JOURNAL" will be aware that stoppages or threats of stoppages on account of the employment of non-Unionists have been unpleasantly frequent in the coal industry during the past year or two; so that this fresh move on the part of the employers—suggested, doubtless, by the judgment of the House of Lords in *Quinn v. Leathem*—will, if successful, have far-reaching effects upon Trade Union policy in the coalfields. If the officials find that their dictum is not sufficient justification for a stoppage of work, involving material loss to the employer—that, in fact, they are liable and likely to be called upon to show just cause, or be mulcted in damages, for every stoppage—and that the existence of what is displeasing to the Union is not *ipso facto* justification for a general cesser of work, there will be more individual freedom and less vexatious interference with business in the collieries of Great Britain than there have been for many a long day.

The coalowners are certainly doing well in tackling the Federation in an all-round manner like this. The overbearing and presumptuous conduct of the men's leaders has of recent times become so marked that to submit quietly to the latest development—the "stop day" policy—would have been suicidal. That the struggle for the management of the South Wales coal trade (for that is what the matter virtually amounts to) will come to an end without an open fight, pre-destined to cause immense loss to both parties, and to that third party to every great industrial struggle—the nation—we still hope, which, however, is a different verb from that "to expect." The men will have to show a very much less aggressive spirit, and adopt a very different policy in the coming year than they have in the past, if peace is to be maintained. A coalowner cannot be expected to have less courage and spirit than the proverbial worm.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1746.)

THE working week on the Stock Exchange was, of course, much cut up by the abstraction, as holidays, of the two middle days; but the effect was not nearly as prejudicial as might be imagined. The tendency was rather shifty at first, according as the intelligence from the seat of war was good or otherwise; and the South American squabble caused some anxiety. But, with the adjustment of the latter, and with the evidence of progress in South Africa, despite regrettable incidents, the tone was much improved, and professional "bears" bought back smartly. The holidays greatly interfered with the settlement; and the Exchange had to be kept open till late on Saturday afternoon to make up lost time. Prices in almost all departments show an advance, and the year is ending cheerfully. In the Money Market, there was a very strong demand, as there always is at this season; and money for short loans commanded high rates. But discount was rather easier. In the Gas Market, there was a total absence of all animation; and business was languid and quite devoid of interest. We remarked last week on the paucity there has been of buyers in the market for some little time past; and the condition remains the same and unchanged. Almost as a natural consequence, the majority of prices have suffered; for where, owing to a necessity to realize, stocks are pushed for sale, the dealers do not feel themselves in a position to offer anything better than a very moderate price. This condition of things is only temporary, and may change at any moment. It is quite independent of the actual prosperity and prospects of the undertaking for the moment being dealt in. So shareholders need not take fright, but should sit tight on their stocks if they can. Gaslight ordinary was very moderately dealt in at the old figures; but it was a little inclined to shrink, and the preference did give way a point. South Metropolitan was steady and unchanged. Commercial old was sold once at the nice price (for the buyer) of 265; and the quotation fell a couple of points. There were a few transactions at weak prices in the Suburban and Provincial group; and Alliance and Dublin old fell a point. In the local market, Sheffield "B" and "C" were advanced another point. The Continental Companies were hardly touched; and their prices did not move. There was nothing noticeable in connection with the gas undertakings in the remoter world, beyond a fractional fall in River Plate. Business was slack among the Water Companies; and prices were only middling. But the only actual change in quotation was in the upward direction; being an advance in one of the West Middlesex debenture stocks.

The daily movements may be briefly summed up: On Monday, Commercial old fell 2, Alliance old 1, and River Plate ¼. On Tuesday, West Middlesex Water 3 per cent. debenture rose 1½. On Saturday, Gaslight preference moved back 1.

The report of the Diesel Motorenfabrik Gesellschaft, of Augsburg, for the last financial year has just been issued. It is stated that, owing to the general trade depression in the country, the works are at a standstill, with the balance-sheet showing a total loss of £26,227.

ELECTRIC LIGHTING MEMORANDA.

A Retrospect of 1901.

THE end of the year finds the electrical industries of the United Kingdom in a condition different in several respects from that in which they began it. This is only what is to be expected of trades still so young as to retain something of the uncertainty as well as the attraction of novelty. Even the oldest of the electrical industries—telegraphy—has been shaken to its centre by the successful extension of Marconi's method of electric signalling without wires. For the first time in the world's history, there was exhibited the striking fact of a steamship carrying the Heir Apparent to the English throne round the sea-girt Empire of his father, yet remaining in daily communication with the capital. Apparatus for wireless telegraphy was fitted to many warships and ocean liners, as a matter of course; and the long-standing problem of effecting telegraphic connection between lightships and the shore was solved in the same fashion. Although Marconi signalling thus entered the region of commercial enterprise, the older telegraphy has not in any way depreciated thereby—it being generally understood that there is nothing in the wireless signalling to interfere with wire or cable telegraphy.

The application of electric traction to street tramways made considerable progress during the year. An extensive tramway system to feed the Central London Electric (tube) Railway at Shepherd's Bush was opened by the London United Tramways Company. Later on, the Company entered into an agreement with the Middlesex County Council, of which Mr. Littler, K.C., is Chairman, to work the whole of the tramways in which this body is interested. Meanwhile, the London County Council gave out the first of their contracts for converting the Metropolitan tramways to electric traction; this being the largest job of the kind yet undertaken by British electrical engineering firms. The London County Council also decided to try the experiment of constructing a shallow tramways-subway, with accommodation for gas and water pipes and electric cables, underneath the new street in course of construction between Holborn and the Strand. A considerable extension of the deep-level tube system of electric railways in London was promised; but no additional ones were sanctioned by Parliament, pending the report of a Joint Committee on the subject generally.

An important operation in railway and electric finance was concluded, with the result of placing the control of the Metropolitan District Railway Company in the hands of an Anglo-American combination of capitalists, headed by Mr. Yerkes, a Chicago street railway magnate. The competition of the Central London Electric Railway and its West London tramway feeder having seriously affected the revenues of the Metropolitan and Metropolitan District Railway Companies, it was decided to proceed forthwith with the long-delayed electrization of these lines, beginning with the Inner Circle constituting the old London "Underground" line. An arbitration was held to determine the method by which this process should be carried out, resulting in a decision favouring the plans of the Yerkes Syndicate, which were to work the lines by the direct current at the usual traction voltage of 550 volts or thereabouts, instead of by the newer three-phase high voltage system preferred by the Metropolitan Company's advisers. The drawback to the selected system is the risk of electrolytic action upon gas and water pipes by waste current. The question of this new danger to gas and water mains agitated Gas and Water Companies during the Parliamentary Session; but no satisfactory settlement was forthcoming. Very remarkably, the question of safety to passengers largely influenced the Arbitrators who settled the Metropolitan Railway matter; and before the year was much older, a passenger was killed and his body burnt on the Central London line, while a dreadful accident, involving many casualties and a serious fire, has just occurred on the Liverpool Electric Railway. Evidently, safety in electric traction is a question of relation and of degree. Still, the popularity of electric railway and tramway working is incontestable, and foreshadows an enormous extension of the method during the next few years.

The electric driving of workshop and factory tools appears to be gaining popularity in the United Kingdom, but not very rapidly, by reason of the high initial expense. The combination of the gas-engine (sometimes using fuel gas specially made on the spot) and three-phase electricity for the transmission of the power, represents the most advanced practice. The simplicity of the three-phase motor is its great attraction. All the same, it cannot truly be said that electric power is the subject of really good business. Although several electricity "in bulk" generation and distribution schemes have received parliamentary sanction, very little has been done to justify it. The most practical venture of the kind is that of the Walker and Wallsend Gas Company, which is an example of several large users of power combining to supply themselves with electricity in quantity from a common centre. In towns, there is no indication yet that electric motors, taking current from street mains, can supersede the gas-engine.

The application of electricity to manufacturing purposes still lacks adequate inducement. Something like a panic in electric engineering trades on the Continent has supervened on a period of inflation, during which works for the manufacture of calcium carbide were erected everywhere far in excess of the requirements. Some excitement was created by a report that Edison has invented a secondary battery lighter and more serviceable

than the lead cells of which accumulators are now actually made; but little more has transpired concerning this new battery. Electric cabs have vanished from the streets; and although there are a few electric road-motor carriages to be seen, this most desirable of all means of mechanical "motoring" does not seem to prosper. While mentioning the Edison cell, it may be convenient to state that there has been no epoch-making discovery in connection with industrial electricity. The Nernst lamp appears singularly shy; and the Welsbach osmium lamp delays its coming.

In electric lighting, there is much, or little, to chronicle, accordingly as one approaches the subject, from opposite sides. There is nothing new in the way of lamps or machinery. Electricians have not yet made up their minds as to the proper way of charging for electric light supplied from central stations; the subject having been re-discussed within the last few weeks at the instance of Mr. Arthur Wright, the author of the well-known Brighton system of charging. There has been a considerable addition to the number of electric lighting undertakings in operation, all owned by local authorities. On the other hand, the extension of electricity in bulk distribution schemes, which are supposed to be good for English industry, has been much opposed by municipal undertakers of electric lighting. No reliable information is yet available as regards the working expenses of municipal electric light plants in combination with the burning of town's refuse. Dissatisfaction and disappointment were experienced in respect to the financial results of municipal electricity supply. Very few such undertakings have a depreciation account, and most of them are a burden upon the rates. At Bath, the imminent insolvency of the Corporation Electric Light Committee has caused the dismissal of this Committee and the taking over of their functions by the Council as a whole. The prevalence of municipal trading, especially in electricity, has led to some deplorable aberrations of municipal book-keeping, designed to conceal losses.

The essentially competitive character of the statutory electric lighting business was manifested by the extension of the Charing Cross and Strand Electricity Supply Corporation into the City of London. Although this move was popular, great dissatisfaction was caused by the tearing up of the streets for the laying of the additional cables. The practice grew of distributing electricity for lighting purposes at the highest voltage permitted by the Board of Trade regulations. In London, the change of voltage has been completely effected; the opposition to it on the part of consumers having died away. Very few incandescent lamps other than those described as for high-voltage are now advertised in the technical journals. The original Ediswan make of lamps has numerous rivals; and the Company have fallen upon evil days. The arc lamps in general use are largely of the enclosed type, of comparatively low illuminating efficiency, but considerable practical convenience.

A good deal seems to be done in the way of "free wiring" of houses for electric lighting, more especially in poor neighbourhoods. It is perceived that without assistance residents in such localities cannot become customers of the electric lighting authority, which consequently co-operates with and licenses some wiring company for the district. At first, this "gratis" wiring was usually charged for by the addition of something to the price of current; but this method has the disadvantage of making a dear service appear still dearer. The system now preferred is based on the principle of making a fixed annual charge per point wired. Tenders for wiring on this system are advertised for like other municipal supplies. The poor consumer has, of course, to pay rather dearly for the assistance; but it is difficult to see how this can be otherwise under the circumstances. It is not many local authorities who possess the means, even when they have the power, to wire their customers' premises. It is interesting to note that there is scarcely any difference between the cost of electric light wiring and gas piping, per point.

In conclusion, let us quote from an address by Mr. John F. C. Snell, of Newcastle-on-Tyne, to show the opinion entertained by electric lighting engineers of the potentialities of their industry: "The applications of electricity are becoming more universal every year, and must become eventually as universal as are those of steam and gas to-day. It is simply a question of time; but it will inevitably come, just as all other known things in this universe evolve from a less to a more efficient condition." This is the rivalry which the gas industry of the United Kingdom has to meet; and the struggle is in places made all the harder through the circumstance that electric lighting is subsidized out of the rates—rates to which the gas companies are heavy contributaries. Happily, the gas industry is not without its own powers of defence; but those who are responsible for its proper conduct would be false to their trust if they were to shut their eyes to, or minimize, the serious meaning to them of this confidence in the future which is professed by all electricians. The same faith that electricians proclaim is unquestionably entertained by very many people, perhaps by the majority of persons with no pretention to technical knowledge. And it has a certain—albeit a vague—effect on the cost of gas capital. Nothing but a steady increase of gas consumption can adequately deal with this situation; for that is a stubborn fact which prophecy will not touch.

H.R.H. the Prince of Wales has accepted the presidency of the Society of Arts, which was vacated by His Majesty the King on his accession. It has been temporarily held by Sir Frederick Bramwell, F.R.S.

THE LONDON COUNTY COUNCIL REPORT ON SHALLOW UNDERGROUND TRAMWAYS.

THE promised Joint Report of the Tramways Manager and the Electrical Engineer of the London County Council, on the construction and working of shallow tramways and subways in Boston and New York, has now been published among the other excellent red books issued by the Council's printers. Everybody interested in the subject may now, therefore, at the price of this publication, form his own judgment, according to his competence, as to the value of the net result of these eminent officers' observations and conclusions. It would be discourteous to omit mention of the circumstance that to the officials' report there is an addendum by Mr. J. Allen Baker, Vice-Chairman of the Highways Committee, who has himself been responsible for an earlier pamphlet on a similar subject. Consequently, Mr. Baker is entitled to rank as an expert in this matter—as County Council amateur experts go. There is a heavy crop of them in Spring Gardens.

It would be going beyond our proper province—thus laying ourselves open to the imputation of posing as competent to offer an expert's opinion upon every department of modern civic enterprise, which is the amicable weakness of the busybodies of Spring Gardens—if we were to attempt to deal incisively here with the subject matter of the report, *quâ* tramways. It is permissible, however, for anyone to discuss a matter of such great and general interest in the light of common intelligence, as well as to bring to bear upon particular points any special powers of criticism which he may happen to possess. The first consideration that strikes one, on dipping into the report, is that the genes is of the Boston subway was altogether different from any thing existing, or that could ever exist, in London; while it was fairly comparable to conditions actually prevailing in Glasgow and some other large towns in the United Kingdom. That is to say, the central parts of the City of Boston—and Tremont Street, its principal thoroughfare for all purposes, in particular—were crammed with tram-cars, which "moved in an almost unbroken procession with a slowness which was vexatious, aggravated by stops of uncertain duration. The rate of progression was often not more than two miles per hour."

There is, in American cities, only the tramcar as a means of conveying passengers—cabs, omnibuses, and private carriages being practically unknown. It might have been surmised that their own observation in this regard would have engendered in the minds of the deputation a suspicion that things are not quite the same in Boston and in London streets; and this thought might have suggested another—that treatment which suits one place well enough might not exactly fit the other. No such inconvenient reflections appear to have disturbed the ideas of the deputation, although they did make a note, which stands at the head of their recommendations, to the effect that "the subway in Boston answers the purpose solely of relieving the street traffic in a congested area, by taking the surface cars underground where traffic is great; the cars coming to the surface again where the traffic is less dense." Which is as much as to say that it is a local expedient, to be appraised accordingly. No attempt is made to show that the same conditions of street traffic which evoked this expedient in Boston, are paralleled anywhere in London. Here, the necessity for putting the tramcars underground in the central region is obviated by the absence of tramways, in accordance with a settled parliamentary understanding. It is only just to the London County Council to admit that they are incessantly trying to break this understanding by pushing tramways across the Thames bridges, along the Embankment, and throughout the whole of London. They apparently wish to make London a tramway town, regardless of every antagonistic consideration. Why should not the democracy have its tram-cars in Piccadilly?

There is another little peculiarity of the Boston subway. It is only made for "single-decker" cars, which type of car, we are informed, "is practically compulsory for shallow subways, both in order to reduce the height of the tunnels and also to prevent any danger to passengers on roof seats." This reveals one more difference between American and English practice; but what of it? There is yet another disconcerting discovery. The Boston subway has no provision for pipes! What a pity. The deputation were surprised at the oversight; and record their opinion that a proper provision for pipes could have been made without in any way interfering with the use of the subway for tramway purposes. "A large number of pipes and electric mains were met with during the construction of the subway. Those which lay near enough to the surface of the road not to interfere with the subway roof were temporarily supported, and afterwards left in their original positions. Others were relaid outside the subway walls." It might have struck the deputation that another way of treating these articles would have entailed an alteration of the estimates. Upon the not unimportant question of the effect of putting the tram-cars underground on the commercial significance of the street traffic, the deputation are commendably reticent. They did not know what the street was like before; and presumably did not think it necessary to have a chat with a frontager on the state of trade, his assessments, and so forth. All they venture to say is that "in Tremont Street to-day, quick vehicular traffic can be conducted without the slightest inconvenience." But seeing that they had already remarked that such traffic practically

does not exist in American cities, the statement does not amount to much.

Next we come to that part of the report—a small one—which relates to New York, as to which it is just as well to premise that the nature of the street traffic requirements is more dissimilar from those of London than in the case of Boston. It is, therefore, increasingly imperative to keep the local factor well in evidence in any survey of the significant features. New York has the plan of the skeleton of a flat-fish. There is no radiatory traffic. It is all up and down along Broadway, which is the backbone of the skeleton, and its parallel streets. The perpetual problem here is to carry ever more and more people up or down. There is no physical interruption to any such line that can be traced over, along, or under any street. Such a topography could not be more unlike the ground plan of London. Consequently, when we are informed that the New York Rapid Transit Commission decided upon shallow subways "as being most likely to afford the best facilities for rapid transit to the citizens of New York," it is possible to compliment them upon knowing their own business, without necessarily concluding that the same choice would prove as suitable everywhere. It transpires that the New York subway, which is sufficiently, though by no means thoroughly, described and illustrated in the report, does not contain either pipes or wires. It is essentially a "covered way," and mostly under the side-walks of usually wide thoroughfares not carrying much traffic. It is just high enough for "single-decker" cars, and is supposed to be made water-tight by asphalt linings and felt roofing. "The question of providing 'pipe galleries' along the line of subway was considered by the Commission, and a special report was prepared by the Engineer; but we understand that no provision has been made." As an American friend would say in the circumstances, "We call for the production of that report." It would be at least of equal value with the rest of this publication, not excepting the "addendum." The above illustration may perhaps be taken as sufficiently indicating why the Commission deemed it desirable to leave the pipes outside their contract.

Now for the conclusion of the whole matter, which, known and approved in secret by the Highways Committee, determined the London County Council, largely on faith, to promote the Bill in Parliament which has been noticed in our Editorial columns. The report lays it down that "the problem" in London—that is, the problem of rapid passenger transit—"will never be satisfactorily solved until the tramways north and south of the River Thames are linked together." Here it would have been just as well if the reporters had stopped; for this declaration gives the measure of their capacity to judge the situation. They go on, however; and every succeeding sentence proclaims them more hopelessly misled. There is no evidence in existence of any great need for fast tramway intercommunication between (say) Peckham and the Marble Arch. London has a centre, to which people resort from every point of the compass. It also has a river, which partly bounds and partly divides this centre. The County Council officials are under the delusion that Parliament has objected to tram-cars crossing Westminster Bridge "by reason of most of the proposals being for horse traction." Doubtless, overhead trolley-wires would be an adornment to any Thames bridge; but Messrs. Alfred Baker, Tramways Manager, and John H. Rider, Electrical Engineer, have a good deal to learn about Parliament, and also about London, if this is the sum of their united wisdom on the point. They proceed to remark, somewhat fatuously, that "the physical difficulties of making adequate connection between the north and south tramways by means of surface lines are almost insuperable, involving street widenings through some of the most valuable business property in the world." We should have thought that the River Thames was the chief obstacle. Unmistakable as the river is, these reporters will not see it. Probably, they were instructed not to take cognizance of the fact that two rapid transit subways are already at work under the river, with a third in process of completion. These do not belong to the County Council, and therefore do not exist for it.

The tacit obligation to ignore everything except what might suit the County Council tramways system makes nonsense of these painstaking officers' recommendations. They appear to want to tunnel the river for trams, but shrink from absolutely saying as much, probably through the reasonable fear that this would hardly be "shallow subway construction."

The report fastens with evident relief upon the solid truth that it would be a good thing if in the making of shallow subways in the streets of London, provision were made for putting in them pipes, cables, and wires, so as to obviate the breaking up of the streets. In contemplating this homely truth, it is possible to forget for the moment the obstructive river, the unsympathetic Parliament, and the City and West-End local authorities blind to the charms of County Council tramways. Therefore the reporters remark that there is no need to dwell upon the subject of the great inconvenience and annoyance due to the breaking up of streets for mainlaying purposes. It is all right as regards new streets; but the expense of constructing pipe-subways solely under existing principal thoroughfares would doubtless be regarded as prohibitory. "By constructing subways which could be used for passenger transit purposes, as well as for taking pipes, &c., a considerable revenue would be earned—sufficient, in our opinion, to warrant the heavy outlay." If this means anything, it means that every principal street should have its covered tramway, with pipe accommodation. Clearly, this is a very different thing from making one through transit tunnel, which is all that Boston or New York needs. Is the tramway to go wherever the pipes lie; or the pipes only to be laid where there is a covered tramway; or how is it to be? And who is to pay? The report is saved from being merely academic by enshrining the proposal to make a tramway-subway from Wellington Street, Strand, to Holborn, under the new street.

It is not necessary to take very seriously the addendum of Mr J. Allen Baker. He seems to have had a general supervision over the investigation, with the result of which he is naturally highly pleased. Of course, he favours the shallow subway principle, "especially when the construction and operation is undertaken by the municipal authority." He thinks that putting the pipes and wires into such subways would yield a revenue—be "financially profitable," in short. The Gas and Water Companies are to be charged for using the subways. Mr. Baker is another clever gentleman who has most decidedly to learn something about the matter in hand.

Engines for Blast-Furnace Gases.—In the report of the Société Cockerill of Seraing, Belgium, for the last financial year, it is stated that, owing to the great demands, from outside sources, on their engineering department, for gas-engines to work with the waste gases of blast-furnaces, they have only been able to equip their own works with one engine of this type—its capacity being 600-horse power. It is proposed, however, to put down a number of additional engines at an early date, with the view of utilizing all the available waste gases, and they will furnish the power required in the Company's finished iron department, as well as in their electrical section.

OBITUARY.

Sir HENRY GILBERT, the eminent agricultural chemist, who was so long associated with the late Sir J. B. Lawes in the agricultural experiments carried on at Rothamsted, died on Monday last week, in his 85th year.

The recent death in announced of Mr. GEORGE EDWARDS ORME, son of the late Mr. George Orme, of the firm of Messrs. George Orme and Co., of the Atlas Meter-Works, Oldham. Deceased, who was only 38 years of age, had been compelled, owing to ill-health, to reside at Morecambe; and he had not been to the works for the past few years.

PERSONAL.

Mr. A. J. JACKSON has been appointed Engineer and Manager of the Padiham Gas-Works, in place of Mr. J. R. Smith.

Mr. H. J. T. SMITH, of the West Middlesex Water-Works Company, has been selected, out of 90 applicants, for the position of Assistant-Engineer to the Devonport Water Company.

We are gratified to find that Mr. HAROLD B. DIXON, M.A., Professor of Chemistry and Metallurgy in the Owens College, Manchester, whose name is so well known in connection with the gas industry, and whose contributions to its literature have from time to time appeared in our columns, is a member of the Royal Commission on Coal Supplies, the appointment of which is announced elsewhere.

The Conservative members of the Bolton Town Council entertained the Mayor, Alderman JOHN MILES, J.P., to a complimentary dinner a few days since, in recognition of the conspicuous ability and success with which he occupied the responsible position of Chairman and leader of the party from 1894 until his elevation to the civic chair in November. As a memento of the value in which his services were held, an inscribed gift of sterling silver candelabra, subscribed for in the town by the Conservative members of the Council, was handed to Alderman Miles on the same occasion.

On the 16th inst., Mr. T. Goulden presided at a dinner (at Kettner's Restaurant) given in honour of Mr. G. A. HORTON, who for many years was Engineer of the King's Cross station of the Gaslight and Coke Company, and has recently retired. A valuable gold watch, subscribed for by his colleagues, was presented on the occasion. In making the presentation, the Chairman bore testimony to the high professional ability of Mr. Horton. The Vice-Chairman (Mr. G. F. L. Foulger), in the course of his remarks, stated that the liberal pension granted to Mr. Horton by the Court of Directors was the most valuable testimonial he could possibly carry with him into his retirement. Mr. Foulger concluded by wishing Mr. Horton many years' enjoyment of his retiring allowance. Mr. Horton's popularity was not confined to his colleagues in office, as, shortly before, the working staff of his station entertained him at dinner, and presented him with a pony and village-cart in token of their high appreciation.

At a pleasant function, over which Mr. J. G. Newbigging, Engineer to the Manchester Corporation Gas Department, presided, on the 20th inst., Mr. J. S. NAYLOR was the recipient of a testimonial, consisting of a massive oak "smokers'" cabinet, from the officials and employees of the Bradford Road Gas-Works of the Corporation, on his appointment as Manager of the Rochdale Road station. The presentation was made by Mr. Jennison, the Chairman of the Bradford Road Works Committee of the Corporation, who spoke in highly appreciative terms of Mr. Naylor's character and abilities, and assured the staff that the Committee were always ready to recognize and reward similar good qualities in their employees. The same avenues to success were open to all. On behalf of the staff and workmen, he expressed his great pleasure in presenting this token of their regard for, and goodwill towards, their former Deputy-Manager. Mr. Naylor, in responding, thanked Mr. Newbigging and Mr. Jennison for their kind remarks concerning him, and said he was very gratified at receiving from those with whom he had been associated so substantial a proof of the sincerity of their regard for him. He thanked them for the loyal assistance he had received during the three-and-a-half years he was at Bradford Road, and said he hoped similar feelings of good-fellowship and unity of interest would exist between them and the present Manager (Mr. Hill) as were extended to himself. He congratulated his successor on having so competent and trustworthy a staff under his control. He had always tried to work amicably and unitedly with them, ever studying their masters' and their joint interests; and he felt that in this he had been successful.

The Gas Institute Transactions.—We have received the "Transactions" of the Incorporated Gas Institute for the current year. In addition to the report of the 38th annual meeting, held in London in June, under the presidency of Mr. T. O. Paterson, of Birkenhead, the volume contains some notes on the visit to England of the Société Technique the following month, and on the proceedings of the Gas Section of the International Engineering Congress at Glasgow in September. The papers are illustrated where necessary, and there are four folding plates. The useful subject-matter index, which has of recent years been a feature of these volumes, has been brought up to date. The contents of the book were edited by the Secretary of the Institute (Mr. W. T. Dunn),

NOTES.

Preparation of Varnish Paints.

In view of the increased importance assigned to varnish paints for preserving steel and iron structures, it is interesting to note that claims are being advanced for a new process of manufacturing varnish, which consists in heating the gum under pressure in a closed utensil. Mr. Arthur J. Smith has brought this process under the notice of the London Section of the Society of Chemical Industry. By the usual process of varnish making, in which the gums are melted in an open vessel, from 40 to 50 per cent. of the weight disappears. If the new method answers in the long run, one part of gum will make 8 or 9 parts of varnish, instead of only 5 parts as at present, and at no greater cost. This would be an immense advantage to large consumers of varnish; but unfortunately there is a doubt as to the efficacy of the new process. It is a curious circumstance that chemistry knows nothing of gums and varnishes, the preparation of which is a secret trade. The German analyst Lippert does not believe in the new process at all, finding that although it does succeed in getting the gum dissolved in oil, the former settles out of it again on cooling or the addition of dryers. There appears still to be great difficulty in dissolving the best Zanzibar copal (gum animi) which makes the very best and most resistant coating.

Heat Radiation of Asphalte Paving.

It has frequently been urged that one of the disadvantages of asphalte for street paving purposes is its excessive heat; and we are therefore glad to see it stated by our up-to-date contemporary, "The Family Doctor," that this is an erroneous idea. As the result of a careful test to determine the comparative heat radiation of various kinds of paving, it was found that the average temperature of macadam was 102°, of asphalte 113°, of granite 115°, and of wood 124°. It would thus appear that, of the four materials of which trial was made, macadam is the only one superior in this respect to asphalte. Further tests, however, seemed to show that macadam pavement possessed several other advantages over asphalte particularly. It is said to retain water longer after it has been sprinkled, and that it is much easier to keep the dust laid upon it. The difficulty of keeping an asphalte surface properly wet, renders it more dusty than might be thought to be the case; and besides this, constant use has the effect of grinding the material into fine powder. The conclusion at which our contemporary has arrived is that, though asphalte has many advantages, it does not (nor does anything else so far introduced) form an ideal paving. One is needed that will not retain and radiate heat, and the surface of which can be kept clean and wet.

Strength of Masonry Piers.

The Austrian Society of Engineers and Architects have been honourably distinguished for the extent and value of their organized experimental research work. The Society's investigation of masonry arches, reported upon in 1895, established the principle that the design and computation of the stability of masonry arches should be based on the theory of the elastic arch. This inquiry left unsettled the amount of resistance to compression to be expected from masonry structures. Data on this head are plainly necessary for the formation of correct ideas respecting the stability of stone and brickwork buildings. The Austrian Society have therefore since 1897 carried out a series of tests of the bearing capacity of piers and floors constructed of different kinds of masonry, brickwork, and concrete. Such an investigation covers a wide range of subjects; and the results can only be indicative rather than conclusive. All the tests were made by means of a hydraulic press capable of exerting a pressure of 1320 tons. According to the material of the specimen, the test was begun by the application of a moderate pressure, which was then increased gradually up to the first sign of failure, and finally to complete collapse. The beginning of failure was made noticeable by a cracking sound, and the peeling away of fine flakes from the surfaces and edges of the specimen. This phenomenon was understood to signify that the elastic limit of the body had been exceeded. Generally speaking, the margin between the first failure and ultimate collapse of stone masonry and concrete was smaller than in the case of brickwork. Rubble masonry could be made to bear up to 3000 lbs. per square inch before showing over-loading. Armoured (Monier) concrete would stand rather more than 2000 lbs. per square inch. In all cases the thin layer of mortar in the joints could not be crushed. Unarmoured concrete did not yield good tests. The lack of information as to the quality of the bricks used deprives the results of the brickwork tests of value; but they did not equal the reinforced concrete. It appears from the tests as a whole that masonry structures are capable of bearing greater loads than are usually regarded as fair working stresses.

Depreciation for Antiquation.

An object lesson in the practice of depreciation applied, not to make provision for the renewal of worn-out plant, but to replace with modern plant an installation that had merely become old-fashioned, is narrated by the "Engineering Magazine." It appears that an electricity generating station at Atlanta, Georgia, was equipped with the usual style of American machinery of 1890, consisting of an aggregation of small generating units, added to as the demand increased. This process of addition resulted in the multiplication of machine types, and the conglomeration of

small generating sets, to such an extent that the station was overcrowded. Working became so difficult and expensive that last year, when the oldest portion of the plant was only ten years old, the resolution was taken to reconstruct the entire station and the whole of the system. Apart from the interest which attaches to such an important piece of technical and administrative work, this operation forms a striking example of great changes that have taken place in central station practice in ten years' time; and emphasizes the soundness of the position that it pays to scrap old machinery so soon as it has outgrown its usefulness. Here was a plant, comparatively new, which was thrown away as rapidly as it could be replaced by new and improved appliances, even though this involved the placing of new mains and the construction of new buildings. The conclusion is deduced by the "Engineering Magazine" that while probably the progress of improvement during the past ten years has been more rapid in electrical practice than it has been in some older branches of engineering, the principle is the same. The lesson is therefore clear; and in modern works management the necessity of providing for the rapid depreciation of plant and appliances due to invention and progress can no longer be ignored or disputed. Those establishments which do not admit it are bound to go under in the competition for business.

Book-Bindings and Gas-Fumes.

In a Society of Arts paper on "Leather for Book-Binding," Dr. J Gordon Parker has discussed several points arising out of the recent report of the Society's Committee on the subject of the deterioration of book-bindings. Dealing more particularly with the leather itself, Dr. Parker remarked that unquestionably most of the modern leather used in the bindings of the books contained in the most valuable and important libraries in England shows signs of decay. In many cases investigated by the Committee, books bound in 1885, 1886, and 1887 could not be handled without the leather coming off in the form of dust. Dr. Parker repeated the statement of the report—that, generally speaking, most sign of decay was found in libraries where gas was used for lighting; and that the worst of the damage appeared to have begun about 1860. Investigation showed that the old tanners did not tan their leathers so highly as their modern successors, and used nothing but oak bark or sumach. Modern leather bindings are half-perished already by the processes used in tanning, into which sulphuric acid enters. It was stated, as the opinion of practical tanners, that when once sulphuric acid had entered a leather, it could never be got out again. Consequently, it is not illuminating gas which is the source of this kind of destruction of bindings. Still, prolonged exposure to the products of combustion of gas in the upper part of an unventilated room is the worst possible treatment for bound books. There is, even in such cases, a difference of effect; the lightly-tanned leathers, and those tanned with sumach, coming off best. The usual trade method of treating leather for this purpose appears to about halve the already short wearing life of the leathers. Out of 38 samples examined, 36 were found to contain free sulphuric acid. It is evident, therefore, that sulphuric acid is of almost universal use, either as a brightening agent or to lubricate the dye in the dye-bath. Leather substitutes suffer from the products of combustion of gas even more than leather itself. It is evident that where bindings contain free sulphuric acid to begin with, their decay must be only a question of time—gas or no gas.

Chemistry of Gas Producers.

M. Boudouard has discussed in a French chemical journal the conditions of stability and dissociation of carbonic acid and carbonic oxide gases in connection with the working of gas producers. It appears that the ideal producer should yield merely carbonic oxide and nitrogen in the proportion of 24·3 volumes of the former and 65·6 volumes of the latter. These maximum results are in practice never attained. Owing to dissociation of the carbonic oxide, the gas made always contains carbonic acid, and the more of it as the temperature of working is low. Indeed, the producer can be so worked as to carry off the whole of the carbon. This results from an excessively high velocity of the air through the furnace, because then insufficient time is left for the reduction to carbonic oxide, by taking up more carbon, of the carbonic acid originally formed in the fire. On the other hand, a porous and finely-divided fuel and a high working temperature both favour the production of carbonic oxide. In laboratory experiments, it was found that, whereas in passing carbonic acid gas over carbon at a temperature of about 1100° Fahr. about 23 per cent. of carbonic oxide was obtained, when the carbon was raised to about 1830° Fahr., the whole of the carbonic acid was broken up. Producers cannot be kept at so high a temperature; and hence they always make more or less carbonic acid in the gas. Summing up, in order to get the best out of a producer, the air current through it should be slow, the working temperature high, and the charge of fuel porous and finely divided. In blast-furnaces, the carbonic oxide is found in the hottest part, near the tuyeres, because here the temperature is too high for carbonic acid to exist. If the work of reduction of the ore can be done here, so much the better. The carbonic oxide first formed passes up through the furnace and picks up oxygen from the ore, becoming carbonic acid, which is again reduced by the carbon or fuel above it. This is so much waste of carbon; and in order to check it, the air blast should be as strong as possible, while the fuel should be in the largest pieces. In other words, though a blast-furnace is a producer of combustible gas, this is not to its advantage for its proper purpose.

TECHNICAL RECORD.

EXPLOSIVE GAS MIXTURES.

By Dr. H. BUNTE, of Carlsruhe.

Abstract Translation of a Paper read before the German Association of Gas and Water Engineers.

(*Concluded from p. 1662.*)

In general, the danger from a mixture of gas and air will be less the closer are the limits of explosion to one another, or, in other words, the smaller is the range or field of explosion. Now, it is possible to diminish the range of explosion by admixture of indifferent gases. Bunsen pointed out that carbonic acid was especially efficacious in this direction. Industrially, gases containing carbonic acid are found more particularly in the gaseous products of combustion from furnaces. These have more or less of atmospheric oxygen, amounting to 21 per cent. by volume, replaced by carbonic acid. Ordinarily, the spent furnace gases from boiler furnaces contain 8 to 14 per cent. of carbonic acid, and those from furnaces in which gaseous fuel is employed 16 to 19 per cent. The latter would be peculiarly well adapted for mixing with explosive gaseous mixtures in order to do away with the chance of explosion. In gas-engines, also, the exhaust gases, containing carbonic acid, are to some extent left in the cylinder and mix with the fresh explosive mixture which constitutes the next charge. It seemed, therefore, of interest to ascertain the limits of explosion of gaseous mixtures in which a portion of the oxygen is replaced by carbonic acid.

The results of researches in this direction, as carried out by Herren Eitner and Trautwein, are depicted in Diagram III., so

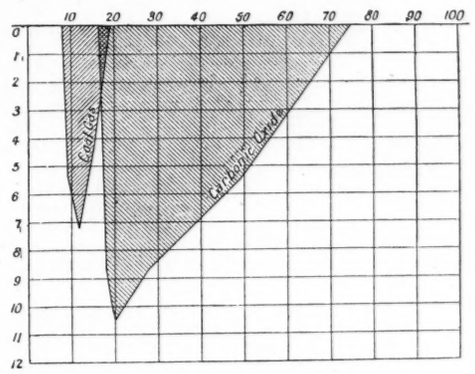


DIAGRAM III.

far as they relate to coal gas and carbonic oxide. The abscissæ represent the percentages of combustible gas in the mixture; the ordinates, the amounts of carbonic acid in the mixture. The carbonic acid has displaced atmospheric oxygen. The diagram shows plainly that the range of explosion of the gas diminishes with an increase in the amount of carbonic acid present. As would be anticipated from the smaller amount of oxygen present in the mixtures, the diminution occurs chiefly at the upper limit of explosion, while there is only a slight shifting of the lower limit, as oxygen still remains in excess in that case. As soon as the upper and lower limits meet, no explosion can occur. It will be seen that the limits come together with about 7½ per cent. of carbonic acid in the mixture in the case of coal gas, and 10½ per cent. in the case of carbonic oxide. Under the experimental conditions observed in these researches, such mixtures cannot be exploded provided 7½ or 10½ per cent. of carbonic acid is present.

One practical application which may be made of these facts, is when it is necessary to displace air by coal gas, as when new manufacturing plant, distributing mains, or gasholders have to be made ready for work. In all such cases, the formation of explosive mixtures of gas and air is unavoidable, though they may be of only brief existence; and it depends on the size and shape of the space filled with air whether the operation is attended with danger, and to what extent. But if the air is first of all displaced by the gaseous products of combustion from a furnace—with gas firing for choice—and the coal gas introduced only after this has been done, all chance of explosion is excluded, provided the mixture contains a certain amount of carbonic acid. As in practical cases the quantity of gas will be great, and the spaces large in comparison with the small dimensions of experimental apparatus, it would be advisable, in order to keep on the safe side, to raise the limit of carbonic acid from 7½ to 8 or 9 per cent.

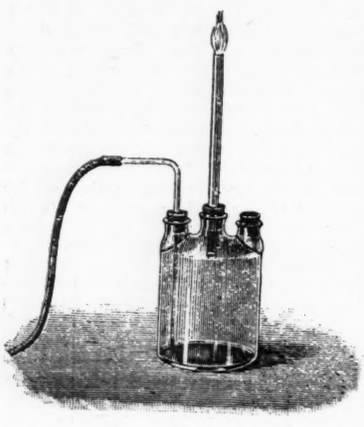
The researches of Herren Eitner and Trautwein had already been concluded when the Municipal Authorities of Vienna approached the author with an inquiry as to how the new gas-works and distributing system of that city should be made ready for work.* On the strength of the researches referred to, and in consideration of the unprecedented problem and its attendant

* This matter was referred to in the "JOURNAL" last week, p. 1657.—ED. J.G.L.

danger, the author strongly recommended the preliminary displacement of air by flue gases; and he is glad to say that the advice was followed. It appears to him highly desirable that this method of clearing out air by means of flue gases containing plenty of carbonic acid, should be employed in other instances before coal gas is admitted, as it can be properly carried out at little cost, so as to ensure against any risk of explosion. The explosions which have occurred repeatedly in the first filling of new gasholders should serve as an express warning to use every possible precaution. Apart from the danger to life and property which is entailed, the whole gas industry suffers from the impression which a catastrophe of this nature creates on the general public; and the erection and extension of gas-works consequently meet with opposition.

The study of the properties of explosive gas mixtures is attended with difficulties in several directions; and there are but few experiments connected with it which can be carried out before a large audience. The author, however, would recall some which serve to demonstrate the great importance of familiarity with the properties of such mixtures.

A three-mouthed Woulff's bottle is fitted up as shown below and, as a precaution, surrounded by a cloth. The bent glass tube is connected with the gas supply and coal gas is allowed to pass into the bottle, while the air, or mixture of gas and air, escapes through the tube of about 0·4 inch in diameter, which is fitted into the middle mouth of the bottle by means of a cork. In a few seconds, the greater part of the air will have passed out, while the mixture within will have passed through first the lower explosion limit of about 8 per cent. of gas, and then the whole range of explosive mixtures ending at about 19 per cent. of gas. The mixture of gas and air, being no longer explosive, can then be ignited at the mouth of the tube. It gives at first the blue non-luminous flame, which will become luminous and smoky as the last residue of air is expelled by the gas. If the cork which closes the third mouth of the bottle is now removed, and the inflow of gas is stopped, air runs down the open mouth into the bottle, and mixes with the gas stored up there. The flame gradually decreases in size, and becomes non-luminous, with the characteristic inner green cone of the bunsen flame. At this point, the flame is formed from a mixture consisting of 35 to 25 per cent. of coal gas and 65 to 75 per cent. of air. The coal gas is mixed with about half the air requisite for its complete combustion, and the upper explosion limit is nearly reached. This is indicated by the flame becoming disturbed, and showing a tendency to spread downwards into the tube, against the continually weakening stream of gas. The rate of flow of the gas outwards is, however, still greater than the low rate of propagation of the ignition of the mixture, which is still relatively rich in gas. As soon, however, as, by the increasing admixture of air, the "detonating gas" limit (when there is about 17 per cent. of coal gas present) and the maximum speed of ignition are attained, the backward movement of the flame prevails, and a green ball of flame passes down the tube, and reaches the gas in the bottle itself, which thereupon explodes with a dull report. The flame of the burning gas rushes out of the openings of the bottle.



One very important property of explosive gas mixtures appears directly from this experiment. The greater the rate at which ignition is propagated, or the greater the time required to transfer ignition initiated at one point to the whole mass of gas, so much the more suddenly will the explosion ensue, and so much the more violent will be its mechanical effect. The precise measurement of this rate of ignition is attended with great difficulties, as a number of causes influence the results of experiments —such, not merely as the nature and proportion in the mixture of the gas, but also the temperature of the mixture, the presence of solid bodies having a cooling action, and whether the mixture is at rest or in motion. Different observers, using different methods, have therefore obtained different values. We are indebted to Mallard, Le Chatelier, Berthelot, and their pupils for the most important observations, from which the values that are used in Diagram IV. have for the most part been taken.

This diagram shows that the greatest rate of propagation or ignition is, for the mixture of air with hydrogen, 4·2 metres (13·8 feet); with marsh gas, 0·6 metre (1·97 feet); and with coal gas, 1·3 metres (4·26 feet) per second. These maximum rates do not, as might be expected, correspond precisely to the theoretical "detonating gas" mixtures, but are attained when there is a slight excess of the combustible gas. With dilution of the mixture, the rate of propagation diminishes, until, at the explosion limits, its value is *nil*. The normal rate of propagation can, however, as Berthelot first pointed out, be increased to the extra-

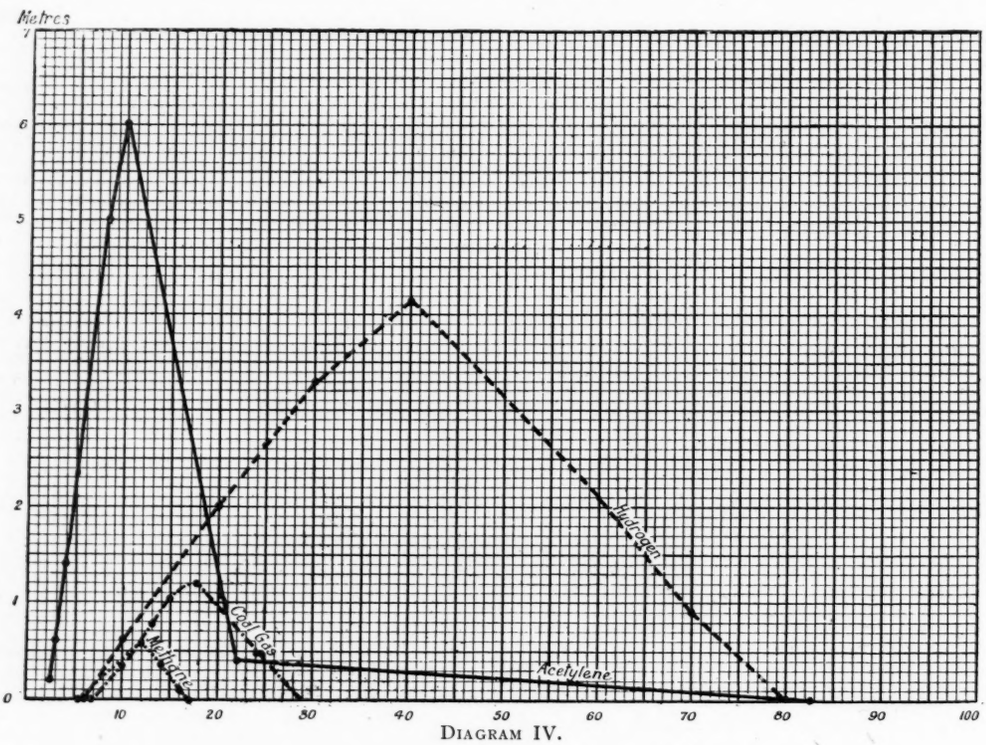


DIAGRAM IV.

ordinary extent of as much as 2800 metres (9190 feet) per second, more especially in closed service-pipes, in which the gaseous mixture is highly compressed. The combustion of the gas then takes place with the peculiar explosion wave which can produce most violent mechanical effects, as has been observed in the case of many fire-damp and gas explosions. It is clear that the pressure of the heated gases on the surroundings is greater the more suddenly their ignition occurs.

So long as the rate of propagation of the ignition remains within the normal limits of a few metres per second, the progress of the combustion can be perceived quite easily, as in the experiment already described. The propagation, backwards from the end of the tube, of the ignition of the gaseous mixture can be avoided, if the velocity with which the explosive gas mixture issues from the tube is made greater than the velocity of ignition. This can be readily demonstrated by proceeding as before, but, instead of

allowing air to enter freely through the third mouth of the bottle, connecting that mouth to a powerful bellows, and blowing air in under pressure. The burning gas ball runs back momentarily into the tube, but is expelled again by the stream of gas; and the flame is ultimately blown out without the gas in the bottle having been exploded.

The backward progress of the combustion can also be prevented by cooling the gas below the temperature of ignition. This can be done merely in the tube by which the gas passes out of the bottle. The narrower the tube is, the more powerful will be the cooling effect it will have on the flame; so that, at a certain diameter, no propagation of the normal combustion downwards will ensue. This can be readily demonstrated by substituting narrower tubes for the wide tube by which the gas issues from the bottle in the experiment described above. With a tube 4 millimetres (0·16 inch) in diameter, the ignition is propagated only an inch or so; and the flame is then extinguished by the cooling action, without the remaining gas being ignited. On diminishing the diameter of the tube to 2 millimetres (0·08 inch), combustion will no longer be propagated at all, even in the most inflammable gaseous mixture. On this observation, made more than eighty years ago, the safety lamp of Davy is based. The wire gauze used in this lamp constitutes in effect an aggregation of very many, very narrow, and short tubes, through which the combustion cannot propagate itself to the exterior. This precaution naturally becomes of no avail, if among the thousands of holes in the gauze (930 to 1225 per square inch) there is but one which exceeds the permissible size, or if the gauze has been injured or made red-hot, or if a violent movement of the air or gas has driven the gas-flame through the gauze. The same principle has been applied in other directions as well as to the safety lamp.

It is clearly impossible, in a communication such as this, to enter into details, or to give practical directions, when conditions vary so greatly. The fundamental facts, however, as to the behaviour of explosive gas mixtures put anyone in the position, to take, in each case, the proper means for avoiding catastrophes, or to elucidate the causes of accidents which may have occurred. But reference may be made to the important part which the facts referred to in the foregoing play in heating by gas, in lighting on the incandescent system, and in gas-engines. In all gas-heating apparatus and in incandescent gas-burners, the principle of the bunsen burner is applied—viz., the coal gas is mixed with a certain quantity of air before combustion. In heating appliances, this admixture of air is intended primarily to make the flame non-luminous, and to prevent blackening of the surfaces with which the flame comes in contact. But there is also the important question of promoting the complete and odourless combustion of the gas, even when cool metallic or other surfaces are played upon. This is attained the more thoroughly the more air is added to the gas before combustion, as Herren Haber and Weber showed in 1896.* The admixture of air, however, is limited by the mixture of gas and air soon reaching the upper limit of explosibility (with about 20 per cent. of gas), when only about half of the air required for complete combustion is present. Thus practically not more than 2½ to 3 volumes of air to 1 volume of gas can be exceeded without—under ordinary conditions of gas pressure—the flame "striking back," which implies that the rate of outflow of the gas is less than the rate of propagation of the ignition backwards from the flame. But by increasing the pressure at which the gas flows out, by using gas under higher pressure, or by applying suction to it, the admixture of air to the gas can be considerably increased. It is well known that this is specially advantageous when applied to incandescent lighting apparatus, which it enables to concentrate the combustion in as small a space as possible, thereby affording the highest temperatures, and, consequently, the best development of light.

It goes without saying that the behaviour of explosive gas mixtures is of supreme significance in gas-engine construction. The development of these engines for the utilization of the relatively poor gases from blast-furnaces and gas-producers rests on a better knowledge of the properties of such gases, of which carbonic oxide is the important constituent. But, while in gas-heating apparatus it is generally necessary to keep above the upper limit of explosibility, it is the aim of the gas-engine maker to keep as closely as he can to the lower limit, in order to accomplish as much motive work as possible with the smallest quantity of gas. The violent explosions produced by mixtures rich in gas cannot be nearly so completely taken up by the moving parts of the engine, and utilized, as the slower explosions of the poorer gaseous mixtures.

The endeavour to consume mixtures poor in gas is favoured by the circumstance, that, as already indicated, carbonic oxide, at high temperatures—such as prevail in the cylinder of a gas-engine—and under a high degree of compression, has its range of explosion greatly extended downwards. Thus, in the more recent types of gas-engines, it has been found possible to produce explosions with blast-furnace gas containing but little carbonic oxide, and thereby obtain extraordinarily high motor duties, which could not be achieved under other conditions. The marvellous perfection of explosion engines which the last decade has witnessed arises from a better knowledge of the behaviour of explosive gas mixtures—not, however, merely from purely scientific studies but from these supplemented by experiment as well as by practical experience. Practice, in this instance, has forged very far ahead of scientific knowledge.

The author hopes that he has shown that the behaviour of explosive gas mixtures, whether they be operating usefully or destructively, presents many applications in the gas industry and in gas-engine works.

* See "JOURNAL," Vol. LXVII., pp. 510, 562, 622, 749, 806.

STOPPAGES CAUSED BY NAPHTHALENE.

At the Winter Session of the Institution of Gas and Water Engineers of the Mark Brandenburg (Germany), an interesting discussion took place on the subject of the removal of stoppages caused by naphthalene.

Herr SARTORIUS (Aschersleben) said that, for several years back he had experienced much trouble from stoppages caused by naphthalene in the works plant. A speech on the subject by Dr. Bueb had, however, attracted his attention; and he communicated with that gentleman. According to his (Dr. Bueb's) advice, he provided himself with a "Standard" washer; filled it with anthracene oil; and since that time naphthalene stoppages had completely ceased, so that he was now perfectly free from it, while formerly he had much naphthalene deposited, especially in the inlet and outlet of the gasholder. A large proportion of the naphthalene, however, remained in the earlier portions of the plant, and in the tar-tanks; so that he had to clean them every fortnight, and often took out two cement-casks full of dirt, which had gathered there. To gain more advantage from the anthracene oil used, Dr. Bueb advised him to employ it for making the tar thin in the tar tanks. He had followed this advice. But about a fortnight ago he had discovered that the tar in the tanks had become thicker instead of thinner; so that he had to warm the tanks in order to loosen the material from the bottom. After putting out of work the bench to which this tank belonged, the substance on the bottom became as hard as asphalte. He had had the same experience with the tar-wells, where the anthracene oil which had been used had produced the same effect. He could not immediately sell the tar, and therefore he was compelled to leave the tank untouched; the result being that the tar subsequently became so thick that the pumps would not work. Since then, he had run the anthracene oil containing naphthalene directly into the tar, and did not let it go first into the wells. The quantity which had to be used for a production of 35,300,000 cubic feet of gas was not very large; but, according to his practical experience, he had decided not to use it any more for thinning the tar in the tanks. He did not know whether anybody else had tried the same treatment. The "Standard" washer had proved very successful; but the attempt to make the tar thin by the use of oil had failed.

Herr ROTHER (Spandau) remarked that when naphthalene obstructions occurred in the works, they could be removed by steam. During last winter, he had had much trouble with naphthalene in his works; but he was pleased to say there had been less of it this year, for the following reason: He had had short ascension-pipes, and consequently the hydraulic main was placed low. Last year, however, a new retort-bench was built, with the ascension-pipes 6 feet longer, and, of course, the hydraulic main was so much higher. Since this bench had been in use, he had never experienced any inconvenience from naphthalene stoppages in the works, but had had more trouble with them in the town mains. One night, about seven o'clock, he was informed by telephone that in one part of the town the pressure was very low. Being Saturday night, and after closing hours, it was impossible for him to make a thorough investigation; and the result was that the trouble continued on the following day, and even on Monday night the pressure was not sufficient. He then found, however, by testing the pressure from lamp to lamp, that naphthalene had collected at a point where the main left the warmer temperature of the ground and passed under the bridge across the River Havel—that was to say, in the zone of frost—and there it had become obstructed with naphthalene throughout its entire length. He at once thought of Dr. Bunte's suggestion to remove naphthalene by means of crude xylol. Fortunately, he had provided himself with a bottle of it, and consequently he was able to apply it at once. The question to be settled was in what condition the crude xylol must be used, and in what way a practical gas manager could ascertain whether or not it was of the proper quality. As prices varied so greatly—differing to the extent of about £10 per ton—he came to the conclusion that there must be several qualities of xylol; and if this was so, the meeting would be glad to know how they could ascertain the right one. It was well known that vaporized xylol would precipitate again by condensation and could be recovered; and thus the fact led him to consider whether it could not be used again with equally good results. This was the question he wished to have discussed. He had on several occasions had obstructions in the same place, and could not get the naphthalene out by mechanical means; but by the application of vaporized crude xylol, an improvement was immediately effected. A blowpipe was of little use in the case of hard frost; but he had often obtained good results by the aid of a charcoal fire.

Dr. BUNTE (Carlsruhe) said xylol had great solvent power for naphthalene, and in this respect was superior to several similar fluids which had been employed. Moreover, it must be borne in

mind that it had the peculiarity of precipitating almost entirely, if the temperature went down to about 10° C. (50° Fahr.). The crude xylol should not contain any easily vaporizing constituents such as hydrocarbons, otherwise (as Herr Rother had correctly stated) that which was to be blown in as vapour in a warm condition would not again precipitate in the next or one of the next drip-boxes. If a liquid containing large quantities of hydrocarbons of low boiling-point was employed, these remained for the most part dissolved, and the gas would become, so to speak, carburetted, and consequently the gas which reached the consumers would be richer in benzol than that generally sent out from gas-works. As this fact had not been taken into consideration in arranging the air-inlets of the Auer burner, the mantles were rendered smoky. A so-called "anti-naphthalene" which had been put upon the market, and which contained a good deal of benzol, possessed this quality. It certainly dissolved naphthalene, but it partially precipitated again, and might interfere seriously with the efficient burning of the gas. This bore upon the question of the quality of the crude xylol. It should contain but little benzol, and not boil below 125° C. (257° Fahr.). The high boiling-point did not militate against the employment of crude xylol in the form of vapour. The small boiler, fitted with a tube, or something similar, by which vaporized benzol could be blown through a hole into the gas-main, might be utilized with xylol for removing the naphthalene from a dangerous part. The vaporized xylol was blown towards the naphthalene, or it flowed with the stream of gas, and dissolved the naphthalene, and in a very short time removed the obstruction. The boiling-point of the crude xylol should not, however, be too high—say, from 125° to 180° C. (257° to 356° Fahr.). It was very difficult to manufacture pure xylol; it was really a mixture of different isomeric hydrocarbons, principally metaxylol. But for the purpose in question, it was not necessary to use pure xylol, which was very dear; the price being regulated by the quality. The crude xylol he had been referring to was known as commercial benzol IV., V., and VI. Their specific gravities at 15° C. were ·875, ·878, and ·900; and at the following temperatures the percentages shown were distilled off:—

Temperatures of Distillation.	IV. Per Cent.	V. Per Cent.	VI. Per Cent.
125°	12	—	—
130°	37	*nil.*	—
135°	61	2	—
170°	81	27	—
175°	90	57	*nil.*
150°	—	76	8
155°	—	86	33
160°	—	90	55
165°	—	—	71
170°	—	—	83
175°	—	—	90

He would be pleased to go into this question; and if Herr Rother would send him some samples of his crude xylol—say, about 1 lb. —he would be able to ascertain its qualities. He wished to make it clearly understood that crude xylol was a relatively cheap hydrocarbon, even if at the present time it was dearer than benzol. Quantities of it could be obtained in the distillation of tar. He might add that crude xylol was specially applicable for the removal of naphthalene in the cases instanced by Herr Rother, where the immediate removal of obstructions at certain points in the canalization, such as where the gas was suddenly cooled in a main which left the ground and was carried above a bridge.

Herr Rother asked if the xylol which had been used and afterwards recovered was of no value, or could it be employed over again.

Dr. Bunte said the xylol contained some naphthalene in solution, but was frequently not saturated with it; and therefore it might be used repeatedly. This could not be done for any length of time; for in addition to the naphthalene, hard tar deposits on the mains were taken up. But the xylol could be recovered by distillation; and possibly the material could be sent to the tar distillery and exchanged for fresh xylol. The commercial benzols he had alluded to had about the following composition:—

	IV. Per Cent.	V. Per Cent.	VI. Per Cent.
Toluol	25	5	—
Xylol	70	70	35
Cumol	5	25	60
Neutral naphthalene oil	—	—	5

With regard to the thickening of tar in the hydraulic main, he would just remark that anthracene oil should not be put into the main, as many of its constituents had high boiling-points, which might easily cause thickening. Consequently, it was not possible to remove naphthalene from the hydraulic main in this manner. But there was another way of removing thickened tar—the one employed in tar distilleries. If tar oils having a higher boiling-point than xylol were pumped through the hydraulic main, the thickened tar would be dissolved. Xylol might also be used without hesitation to remove stoppages in hydraulic mains. He recommended a trial of it.

Herr Sartorius remarked that when he stated that he had had naphthalene obstructions in the works, he should have added that he had also had stoppages in the town mains. This trouble had now become less—or rather, he should say, it had been entirely removed —by separating the two chambers of the washer, and by treating them with anthracene oil. He had drilled holes in several parts of the pipes to ascertain if they were free from naphthalene, and had found that this had been so. The obstructions at the public lamps, which, as was well known, occurred very easily, had also disappeared. With regard to the simple way of removing naphthalene obstructions mentioned by Herr Rother, he (Herr Sartorius) was compelled to consider some means of doing this when these troubles occurred suddenly; and he had to devise something that would be of practical use. He accordingly fixed upon a place between two lamps (he knew the stoppage would occur within 55 yards), drilled a hole in the main, which had been stopped off, inserted the xylol, and then evaporated it by means of soldering lamps. Primitive as the arrangement was, it proved successful. Herr Rother had questioned him as to how he had removed the obstructions, and he told him. Herr Rother had adopted the same method, with the only difference that he had employed coke fires.

Herr Baumgaertel (Luebben) said the main from his works crossed four bridges, and he had to deal with naphthalene obstructions, especially in cold winters, and had done so satisfactorily. From time to time he had poured hot alcohol into the main, through the public lamps, just before it reached the bridge; and since then he had had no further trouble with stoppages. As far as the removal of naphthalene from the gasholder connections was concerned, he did this by simply passing gas liquor through them.

Dr. Bunte subsequently made an analysis of the crude xylol and "anti-naphthalene" employed by Herr Rother, with the following results: The sample of the former was clear and of a yellowish colour, had an aromatic odour, and a specific gravity of ·874 at 17° C. (30° Fahr); that of the latter, water clear, with a strong smell of isonitril, and of ·837 specific gravity—its bromime saturation point being 59·5 per cent. The figures of the following table show the percentage yield by volume of the two materials on distillation:—

Crude Xylol.

Temperature of Distillation.	Per Cent.
80° to 90° C.	14
90 ,, 100	39
100 ,, 110	50
110 ,, 120	53
120 ,, 130	57
130 ,, 140	60
140 ,, 150	64
150 ,, 160	75
160 ,, 170	93

Anti-Naphthalene.

Temperature of Distillation.	Per Cent.
52° to 60° C.	4
60 ,, 70	8
70 ,, 80	18
80 ,, 90	45
90 ,, 100	74
100 ,, 110	89
110 ,, 120	93

LESMAHAGOW GAS COAL.

Practically Exhausted.

Lesmahagow, an ancient parish in the middle of the Nineteenth Century and onwards, was a most important part of Lanarkshire, for, though it lies in a sort of out-of-the-way position of the county, it owes its importance in a great measure to its connection with the great Scottish coalfields which begin in Fife and extend into Ayrshire and immediately adjoining counties. Nevertheless, the strata were so deranged by numerous dykes or fissures, that, where the coals were wrought, the direction and inclination of the strata varied so materially as to set hopes and expectations at defiance. In some places the dip is as 1 in 6, while at Auchenheath (which is in the parish of Lesmahagow), where, as in two other places in the parish, a very fine quality of cannel coal was found, supplying Glasgow and many other towns and cities with illuminating gas, the inclination was practically the same, or 1 in 7. Coal of the same quality has not been found elsewhere in Scotland, if we except the Boghead mineral found near Bathgate, in Linlithgowshire; and even here, in Lesmahagow, and in a small corner of the adjoining parish of Carluke, to which it extends, the thickness of the coal varies from about 10 to 21 inches. In the early thirties, the coal sold for about 8s. per ton on the coal-hill; but in the course of years the price rose very much higher than the amount named by Sir John Sinclair, in his "Statistical Account of Scotland" (which was published in the year 1793), when dealing with the parish of Lesmahagow. He states that cannel coal is "wrought at Woodshouse, belonging to the Duke of Hamilton; at Auchenheath, belonging to Mr. Weir, of Blackwood; and at Blair, belonging to Lord Douglas, and that it was sold at 5s. per ton." He adds that some of it was carted from local hills to places 40 or 50 miles distant.

Perhaps the earliest notice of the Lesmahagow coal occurs in the records of the customs paid upon goods passing through the burgh of Lanark, where it appears that these dues were paid for it more than 200 years ago; and about the year 1833, on the road to Edinburgh by Carnwarth, at the first toll-bar, in the county of Edinburgh, there was seen the special notice that "licht coal" must pay here double toll—a notice which testified to the value of the coal and the comparative importance of the former traffic, as by this time the quality of Lesmahagow coal carted so far in that direction was small indeed. In 1832, there still continued to exist a considerable trade in it for consumption in open fires, both in the adjoining small towns and villages, and in nearly all farmsteads within (say) 20 miles of the works. The quantity consumed by each of these might be small, but it was then considered indispensable to have at least one cart of "licht coal" in the year to brighten up the dim peat fire in "ilka farm toun."

The week of St. James's Fair in Lanark was the principal week of the year for serving the more distant customers; and so late as 1832 the sales of that week were thereby increased. The trade has, however, long since entirely vanished. Towns, large and small, soon came to be lighted with gas, and scarcely any village, or gentleman's establishment of any importance, was without its gas-works. As an example of this fact, the villages of Abbey Green and Kirkfieldbank, both of them in the parish of Lesmahagow, soon became lighted with gas; and as regards private works—taking them in the order of erection—there were soon established at Mr. Sandiland's at Fauldhouse, Mr. Ferguson's at Auchenheath Cottage, and at Stonebyres, Blackwood House, and Stockbriggs, substantial gas-works put up by the several proprietors for their private establishments alone.

The quantity of coals raised from the coal-pits opened at Auchenheath, at Little Gill, and at Nethaufoot was about 8000 tons in the year 1832, and the price per ton was then only 6s. 10d. At this time the Lesmahagow gas coal was struggling into notice; and more than two-thirds of the quantity then sold was purchased for the Glasgow Gas Company, who had then been using it for 13 or 14 years. The price paid at the time was 16s. per ton delivered at the gas-works. The following statistics, at intervals of five years, show the progress of the trade in gas coal for the parish of Lesmahagow from 1832 onwards for a period of 31 years. In the year named, and for many years afterwards, the gas coal wrought at Auchenheath was the only mineral in the parish which possessed any value whatever beyond a merely local one. Allowing 1000 tons for local consumption in that year, it was found that even at that time the money coming into the parish from the sale of coal would be about £2500 per annum, or something like one-tenth of its whole rental. In 1837, the quantity sold yearly had increased to upwards of 11,000 tons, and the money to about £6000 per annum. From 1837 to 1842 there was a considerable increase in the quantity sold, although there was not a corresponding augmentation of the receipts, as the price had declined from 9s. 6d. and 4s. 6d. to 3s. per ton—the quantity sold being 17,000 tons, and the cash receipts about £7000. In 1847 the sales were about 24,000 tons, and the selling price from 11s. to 12s. 6d. per ton. At the former of these prices, the value of coal sold for the year was upwards of £13,000. In 1852 the sales were increased to 30,000 tons per annum; but from foolish and unnecessary competition, the price realized was only about 7s. per ton, or (say) £10,000 altogether. In December, 1856, the Lesmahagow Railway was opened for traffic from Auchenheath to the Edinburgh and Ayr Road Stations on the Caledonian Railway, although it was not opened for through traffic to Motherwell till nearly a year afterwards. In 1857 the total sales were about 60,000 tons, and the net price realized was 16s. 10d. to 20s. per ton; the price per ton delivered in Glasgow being 24s., the same as it was in 1837. The year 1857, however, was an exceptional one, as the quantity of coal sold afterwards was never exceeded in any one year at Auchenheath, and in some years the sales fell considerably short of the quantity.

Auchenheath also produced another seam of gas coal known as the "wee Lesmahagow," or upper seam of gas coal. It was situated 15 fathoms above the main Lesmahagow gas coal; and the geological position and relations were consequently the same. It had been known for many years; but so long as the other could be produced at less cost, in sufficient quantity to meet the demand for coal of that class, there was no inducement to work it. Many years ago, it was analyzed by Dr. Fyfe, of King's College, Aberdeen, who was at that time the chief authority in the kingdom on the analysis of gas coals. That gentleman reported upon it as being, "everything considered," equal in value to the well-known Lesmahagow seam; but when purchasers had a choice, they gave preference to the better known and thicker seam of coal. In thickness it varied from 1 inch to 11 inches, and where seen upon the outcrop there was attached to the bottom of it a band of ironstone from 3 to 5 inches in thickness. As a gas coal it was first-class; but subsequent analyses determined that it was still more valuable as a paraffin-oil coal, being only second to the famous Boghead, otherwise named the "Torbanehill mineral." Mr. James Swan, of Rigside Collieries, got this seam in his workings at the village of Douglas Water, and subsequently discovered it on the adjoining farm of Tawer, and on other lands in the neighbourhood, belonging to the Earl of Home, and all in the parish of Lesmahagow, in the Upper Ward of Lanarkshire. Mr. Swan's mineral yielded 3325 cubic feet of uncondensed gas and 102½ gallons of crude oil to the ton; a ton of the Auchenheath oil coal gave 3250 cubic feet of gas and 95 gallons of crude oil; a ton of Lesmahagow gas coal gave 2850 cubic feet of gas and 81 gallons of crude oil; and a ton of Craignethan gas coal gave 2800 cubic feet of gas and 68 gallons of crude oil. The brown portion of Boghead coal yielded, under similar treatment, 140 gallons of crude oil, and the entire seam of Boghead coal yielded 120 gallons.

The late Mr. James Ferguson, of Lesmahagow, who was for many years the lessee of Auchenheath Farm, and of the minerals over a large portion of the parish, wrote regarding the gas coal, in the year 1865, and said that, so far as was then known, the best portion of the field had been worked out; and of the three divisions of the coal, which were formed chiefly by upheavals, that of Auchenheath was decidedly the most valuable—the coal being more uniform in its thickness, and always accompanied by from 3 to 6 inches of blackband ironstone. The average thickness of the coal (main seam) was 20 inches, and that of the ironstone 4 inches. The thickest Lesmahagow gas coal ever worked was found about the middle of the division, towards the outcrop, on the farm of Little Gill. It was there from 22 to 24 inches in thickness, with the blackband ironstone from 4 to 6 inches thick. He also discussed the question of the occurrence of ironstone in the Lesmahagow coalfield. Blackband ironstone was worked at Brockley, Coalburn, and other places upon the south outcrop of the Upper Lesmahagow mineral basin, where it was found at from 10 to 14 inches in thickness, of which from 4 to 6 inches were rather more coal than ironstone. Clayband ironstone was also met with in connection with the blackband of the Upper Lesmahagow minerals, and they were worked along with it, as was done at Auchenheath; but none of the claybands found in the parish could be worked or sold with profit or to pay rent.

The total quantity of ironstone worked and sent from the Upper Lesmahagow mineral field to the blast-furnaces from January, 1857, to January, 1863, was 80,285 tons, or an average of upwards of 13,000 tons per annum. In the Auchenheath section, there was in connection with the upper and lower gas coals about 9 inches of valuable ironstone of the carboniferous variety, of which from 10,000 to 12,000 tons were annually raised and sold at from 13s. to 15s. per ton of 20 cwt., delivered into railway trucks. The following abstract of minerals exported from Lesmahagow parish in the year 1862 may be of interest. From Upper Lesmahagow there were despatched 15,317 tons of ironstone, at 12s. 6d. per ton, of the estimated value of £9573 2s. 6d.; and 27,026 tons of limestone at 3s. per ton, of the estimated value of £4053 18s. From the Auchenheath district, there was gas coal amounting (say) to 50,000 tons, at 18s. 6d. per ton, making £46,250; 11,000 tons of ironstone, amounting to £7425; 7000 tons of burned limestone, at 7s. 6d. per ton, amounting to £2450; and 10,000 tons of raw limestone, at 3s. 6d. per ton, of the estimated value of £1750.

Mr. James Ferguson, of Messrs. James Ferguson and Co., was by far the biggest man in the development of the Lesmahagow gas coal trade. For a long while the firm employed as many as 500 workmen in connection with the pits and quarries in the district. He died in the year 1873 or 1874, and in the following year (1875) his Trustees ceased working the gas coal. His fortune at his death was about £180,000. But Mr. Ferguson was not the only worker of the Lesmahagow gas coal, for the Nitshill and Lesmahagow Coal Company later on entered into partnership and took leases from the Earl of Home (500 acres), and 1616 acres from the Duke of Hamilton; and in March, 1870, they commenced sinking at Fence Colliery, which is near Tillietudlem Station on the Caledonian Railway. The pit is 175 fathoms deep at Fence. The Nitshill and Lesmahagow Coal Company went on until 1895. Generally speaking, the minerals were the same with both leaseholders. The biggest annual "get" of gas coal (in 1878) was 90,293 tons, and of ironstone 6728 tons. The main seam of Lesmahagow yielded 13,500 cubic feet of gas, the illuminating power of which was 35 standard candles, and the coal was generally 22 inches thick. In price the Lesmahagow gas coal ranged from 22s. to 45s., and even to 50s. per ton. The upper seam, or "wee Lesmahagow" coal, was only worked at Auchenheath, not at the Fence Collieries, and it generally ranged in thickness from 10 to 11 inches; but it was mostly 10 inches thick. The Nitshill and Lesmahagow Coal Company certainly did a very big business in the way of providing people with gaslight. Since they ceased to work the gas coal of the district, another firm, consisting of a local coalmaster and quarrymaster and an Edinburgh coal agent have been trying their power at working the "wee Lesmahagow" seam of gas coal; but how far they have been successful history "sayeth not" as yet.

Use of Oxygen in Calorimetry.—At a recent meeting of the Nottingham Section of the Society of Chemical Industry, Mr. L. Archbutt spoke favourably of Mahler's bomb, while admitting that it is rather a costly instrument. Its working is simple, and it is reliable. Mr. Reddrop, late Chemist of the London and North-Western Railway, has made some very interesting comparative tests of samples of coals with Lewis Thompson's and the Mahler bomb. The result of these tests was to show that Lewis Thompson's appliance, although admittedly imperfect, yielded returns which would be sufficiently accurate for many practical purposes. The difference between the two instruments is greatest with coals yielding a high percentage (80 per cent. and upwards) of coke; probably because the carbon of such coal would not be completely burnt in the Lewis Thompson calorimeter. Mr. Reddrop's tests were made on Lancashire, Staffordshire, Monmouthshire, and Glamorganshire coals. The two former were bituminous, and the latter were anthracite coals. They ranged in calorific value from 7552 to 8448 calories. The sulphur likewise differed considerably in the various samples; the Staffordshire coal being the most and the Lancashire the least sulphurous. On the other hand, the Lancashire coal has as much as 7·5 per cent. of ash, against 3·2 per cent. in the case of the Glamorganshire coal. Screened coal gives higher values than screenings, and contains less ash. On the whole, opinion seemed to lean towards the Lewis Thompson calorimeter as the instrument to be preferred, with the caution that the oxygen should be kept in a gasholder over water, and not used directly from a compression cylinder. It was stated that although this compressed oxygen is not dry, in the sense in which Harold Dixon and others used the term in their classic experiments demonstrating that dry oxygen is not a good supporter of combustion, yet it is sufficiently desiccated to indicate incomplete combustion if directly used without storing over water in the manner recommended by Mr. W. Thompson.

HOT-WATER SERVICE BY GAS HEATING.

It is but a few years since that the gas-geyser dropped into ill-favour with the public on account of several unfortunate occurrences; but in (we think we may use the word) all cases the calamity was directly due to ill-fitted and unventilated geysers. The fault for this did not perhaps lay so much with the makers as with those who were responsible for the fitting-up of the apparatus; but the makers were alive to the situation, and saw that, if something was not done to prevent these recurring accidents, geysers were doomed to banishment as a household expedient. Certain of the manufacturers thereupon determined to take the very proper course of refusing to sell geysers without ventilating arrangements, or to fix them without a vent-pipe; and therefore if unhappily a mishap should now arise, it can only be caused by an utter disregard, on the part of customers' own fitters, of the provision made for ensuring safety. In taking the step referred to, Messrs. Ewart and Son, of Euston Road, were of the foremost; and there is some satisfaction in learning from this representative firm that their insistance on the observance of the very necessary precautions mentioned have not in any way had a derogatory effect upon the trade in these appliances, but, on the contrary, there has been a large increase in the demand. We do not intend to represent that this alone has acted as the spur to the greater requirement for these useful articles. Improvement resulting in economy and in increased temperature, with a lessening of the time occupied in heating (as in the case of the "Lightning" geyser), has had an effect. But, in our opinion, this enhanced efficiency has not been such a great factor in producing the extended demand as the reassurance of the public that absolute safety can be obtained.

Messrs. Ewart, however, have not confined themselves to the perfection of the ordinary form of geyser. They have launched out into much larger classes of work, and successfully; and the new features which they have introduced are of a character which merit notice as coming within the order of real improvement. We cannot possibly devote space to calling attention to the great variety of gas-heating appliances which they can now offer to the intending customer, from which to make a selection; but there are two or three of the more striking to which we may briefly call attention. We take the "Califont" first; this being an arrangement of heater which stands prominent in that it does away with the provision of a geyser in every situation of a house where hot water may be required. It does more than this; it provides a constant service of hot water to any part of the house under pressure, and yet, by its automatic control, expense (save that which is occasioned by the maintenance of a pilot jet) is only actually being incurred while water is being drawn, so that at a moderate cost, it administers to luxury and convenience. In this case, the geyser can be placed in the basement or other place handy for the gas and water supply and for ventilation; and the hot water is conveyed by pipes to the several fixed points at which it may be required for use in the house. The mere action of drawing off hot water in any position turns on, from the main services, the gas and water supply to the heater; the former being ignited by the pilot-jet. This automatic action is obtained by a modification of the dual valve, which has become well-known by its use in the "Lightning" type of geyser. The general arrangement and fittings of the "Califont" will be seen by the illustration, fig. 1. It is, of course, made in various sizes to meet the service required of it. At the Euston Road show-rooms, the firm have one fitted up with service-pipes running to a number of baths, and one or two distant lavatories, so that the efficiency of the arrangement may be tested. We found from a trial that what the firm say the apparatus will do is accomplished. At all points, after allowing the dead water to run for about a minute, there was a continuous flow of hot water; and yet at each turning off of the hot-water taps at the points of emission, the gas was extinguished (except, of course, the pilot), and water ceased to flow through the apparatus. To remove the geyser from the immediate neighbourhood of the user is a great thing; and to obtain an immediate supply of hot water—particularly in these days of gas-cooking stoves—without constantly maintaining an expensive coal-fire will be found of immense value in many houses and establishments. The "Auto-Lightning" geyser is an apparatus which may be classed with the "Califont." One of the main differences is that it must be placed in a convenient position above the highest point at which water is required; and from there hot water can be distributed throughout the house.

The question of heating large buildings and conservatories is one upon which the advice of gas engineers is frequently sought; and in the "Albany" circulating gas-boiler (fig. 2), Messrs. Ewart present them with a ready and economical means of effectually carrying out the work. Of the several sizes of this boiler, we have selected the No. 3 for illustration, which in itself sufficiently conveys the character of the apparatus. This particular boiler will drive 120 feet of 2-inch pipe; and it occupies very little space—its dimensions being merely 10 inches diameter at the base, and the height of the body 12 inches. The advantages of a gas-heated boiler of this kind in comparison with a coal-heated one are apparent. It is more rapid and powerful in heating effect; occupies less ground; and, when once lighted, it will continue to perform its duty without attention. Then when a building is well warmed, the use of the boiler can be partially or entirely discontinued as desired. In these points alone great economy accrues to the user; and there are several other commending features—such as cleanliness and the absence of a stock of fuel—which are too evident to even need mention.

We have only space for a notice of one more of the firm's many types of apparatus for heating; and that is the "Euston" radiator (fig. 3), for which the sweeping claim is made that it is the cheapest method for heating extant. The radiator can be connected by means of a piece of ⅜-inch gas-pipe or flexible tubing. There is an atmospheric burner at the base of the column on the left-hand side; and the column on the right-hand side forms the expansion chamber—the intervening tubes being filled with water. When the radiator is cold, there is no water in the expansion chamber, but when the gas is lighted, the water soon begins to rise in it. The consumption of gas is very moderate; and the attention which the radiator requires is on the same scale—the addition of about a pint of water once a fortnight or so, being all the attention, beyond lighting and extinguishing, that is necessary. We are told it may be taken that, approximately, 2d. per day of ten hours will cover the expense of heating any place or apartment for which such an apparatus is suitable. The radiator is easily regulated; it occupies little space; it maintains the air in a moist condition; and to these and the other advantages that have been mentioned may be added the very pleasing exterior of the arrangement, which permits of its adaptation to almost any situation.

Fig. 2.

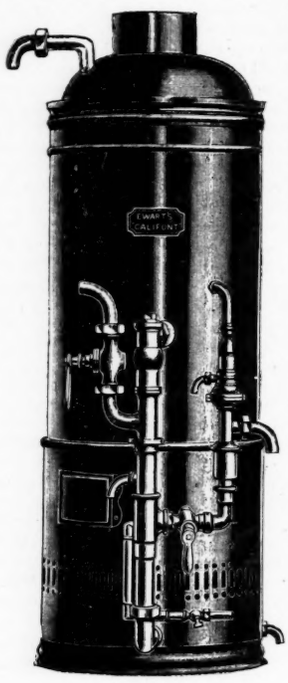


Fig. 1.

Fig. 3.

Although it does not properly come within the scope of this notice, a few words may be said in regard to the Ewart gas-controller. This arrangement consists of an automatic tap to be fixed to the gas-service, and which opens and closes as the lights are turned on or off, and as the pressure increases or decreases from the street main. If part of the lights in a building are extinguished, the controller comes immediately into action, and automatically lessens the flow of gas, thus preventing the flaring of the remaining lights. In fact, we may say that a demonstration of its use is convincing of its ability to maintain a good and steady flame with a few or any number of lights under any variation of pressure.

MASONRY DAMS AND RETAINING WALLS.

The following extracts from a paper on the above subject read by Mr. C. Baillairgé before the Canadian Society of Civil Engineers are taken from the "Engineering Record."

The city of Quebec is pre-eminently one of retaining walls; many of its streets on the inclined or hilly frontage of the town having had to be supported on the down side to level them up to the necessary grade. These walls have almost without exception been made unduly thin. The Des Carrieres Street wall, of some 600 feet in extent, in the rear of Dufferin Terrace, erected about 60 years ago, under Government control, stood its own for only thirty years, and was rebuilt again under Government superintendence. This second edition of the structure again gave way to the earth pressure from the rear of it, and was rebuilt a third time within the last few years under the writer's term of office as City Engineer. The retaining wall at the head of Mountain Hill has during the same period of sixty years been rebuilt twice. A similar fate has overtaken the Artillery Street wall, the Dambourges Street wall; and most of those along the north side of Cote d'Abraham, and other streets, have had to be rebuilt during the writer's time, and generally after a life of only ten to twenty years or less. The splendid cut-stone retaining wall along Commercial Street, Montreal, though built hardly fifty years ago, is, and has been for some years, giving way, in like manner, from earth pressure in the rear; and the walls of the new Louise Docks at Quebec have already become out of plumb and alignment from the same cause.

The impression in all these cases was that the walls, having nothing to withstand or bear up against but the pressure of so much dry earth behind them, needed not to be of a thickness greater than from one-fifth to one-third of their height—sometimes even as low as about 3 feet for a 20-feet wall. The fact was overlooked that the dry earth backing might become waterlogged, and especially so where no weepers had been provided; or even with weepers, if the filling in their proximity was of too retentive a nature, or where, in the case of weepers or no weepers, there had not been interposed between the back filling and the rear face of the wall a narrow space filled with loose stony material to allow water, when reaching the wall, to run to the bottom, and thus find its way out or expend itself by absorption into the underlying soil.

The writer has noticed in many cases of such retaining walls that the percolation into the embankment had waterlogged the filling, and thus caused it to press like a liquid on the intervening wall; causing it to bulge and fall by disintegration, or to give way bodily. Not that this waterlogging of the filling was of a permanent nature, nor need it be, but only of momentary duration, as it might produce a thrust forward of the wall of only the fraction of an inch; thus enlarging the water-containing space, and making room for itself to subside in.

An unmistakable proof of this intermittent and instantaneous action of water, and of the fact of its thus acting during only a second or fraction of a second, is still to be seen along the rear face of Dufferin Terrace, Quebec, where an open fissure in the cliff in the rear of the terrace had, under a persistent and heavy rain of some days' duration, in September, 1899, become filled with water, when, due to the thrust from the rear, an outward portion of the cliff fell forward with the destruction of much property and the loss of some 52 lives. The crevasse alluded to, thus filled with water to a depth of over 100 feet, exercised a hydrostatic pressure which pushed the intervening rock forward by some 6 inches. Could this pressure have been continuous, the thrust of the cliff forward would also have followed suit, or been continuous, the aperture widening more and more till the whole cliff fell forward. But it was not continuous, nor could it be; for the moment the fissure became enlarged the water level fell, and the pressure ceasing, the motion forward stopped short at the same time.

In addition to this action of a waterlogged substance against a retaining wall, there is also in the Canadian climate, the yearly action of frost, which, in expanding the back-filling, as water does in freezing, also pushes a wall forward; and, though it is but as little as the eighth or even the sixteenth part of an inch at a time, it finishes in course of years by effecting its overthrow.

It is therefore seen that all retaining walls are liable to become like dam walls, which have to stand the pressure of water, and that as such the same rules as to strength and thickness should apply. Also that where ice may form in the rear of a wall, and where this ice in forming cannot spend its effort on compressible material towards the rear, and where such substance is solid rock, the whole effort is then against the wall. If repeated from year to year, the wall must go, as nothing can withstand or nullify the effect of ice expansion. The only remedy in such a case is to so impermeably cover the surface of the back-filling with asphalte or other water-tight substance, that no water can get at it, or penetrate the soil in the rear of the wall in a way to run the risk of any ice forming.

The subject of retaining walls would not be complete without an allusion to wooden instead of masonry walls for the same purposes. The author in his time has had occasion to build and rebuild at Quebec some thousands of feet lineal of street-supporting structures of this kind. The respective lives of these walls may be taken at from fifteen to twenty years average for spruce, and twenty-five to thirty years for pine timber. The portions under water, and even those extending to a few feet above low water, may endure indefinitely as far as material is concerned; but these walls, even though secured by cross ties running or tailing deep into the back-filling, or to a depth, for the upper ones, fully equal to the height of the wall or wharf, give in course of time with the earth pressure and frost from behind. They gradually lose their batter (generally of 1 to 1½ in 12) by about a quarter or half an inch per annum, become vertical, and then begin to over-plumb. About the time they are decayed to an extent to require repairing or rebuilding, the over-plumb reaches such a figure that they are ready to topple forward—that is, their fronts or timbered facings, which become torn away from the ties that head into them, as the outer ends of these ties or portions are exposed to wind, water, and weather, also decay, thus allowing the front timbers to be thrust forward, while such portions of the ties as are buried in the back-filling continue to endure, and can outlive the outer timbers for years thereafter.

On the rebuilding of the facings, short ties may be thus used by spiking them to the remaining portions of the old ties; and when on a slope or hill-side, with tendency to slip forward, it is a good, and even necessary, precaution to bolt, and, better still, to fox-bolt, the ties to the adjoining or nearest rock, or attach them to piles or suitable pickets driven deeply into the subsoil. If the back-filling is of stone, more or less stratified and piled in such a way as not to have a tendency to thrust forward, or is of such a clayey nature that percolation from the surface may, instead of sinking into it, run off towards the open, and find its way through or between the face timbers, the wall may endure during its natural life without losing its plumb.

The author has for years past contended that stone dams should at every point of their height be at least as thick as the height of water above that point, including overflow. The weight of masonry of the dam above a horizontal plane at any portion of its height (stone masonry being assumed to be twice the weight of water) should be twice that of the pressure of water above such level, in a dam built in horizontal courses of masonry.

If the binding qualities of the cementing material could persist for so many years as the dam was called on to endure, this thickness would not be advocated; but that it does not persist beyond a definite number of years was shown some few years ago by the failure of the Bouzey dam in France, when 232 lives were lost, and by the failure of the Austin dam. If the cement cannot be relied upon to bind the structure into an indestructible whole, nothing remains to stand the pressure of the water tending to push the dam forward but the weight of the structure and its coefficient of friction of stone on stone or masonry on masonry. This coefficient is known to be but 0·5, though given as 0·7 to start a stone from its state of repose.

The conclusion is inevitable, the author takes it, that for horizontally-coursed masonry, where the cementing material has ceased to be binding, and where nothing is left to resist its being thrust forward but its coefficient of friction, its weight should be twice that of the total pressure tending to move it forward. In other words, it should be (taking its weight, as already set forth, at twice that of the water, or, say, 125 lbs. to the cubic foot) of a breadth of base at the bottom level of the reservoir equal to the depth not only of the water so impounded, but of the upper surface of the water when over-topping the dam.

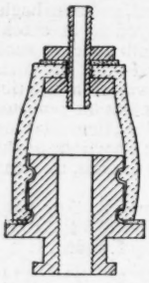
What precedes relates only to horizontally-coursed masonry dams, and where material is at hand to give the dam its required weight and thickness. But when material is scarce or expensive, the want or deficiency can be compensated in either of two ways—by tilting the beds in a manner to have them normal or perpendicular, or more or less so, to the outer slope or apron of the dam, or by dovetailing and interlocking all the component stones of the structure, not only horizontally, but also vertically.

The profession has now taken to the building of dams of concrete instead of masonry. We have in the province of Quebec at least five dams so constructed—at Chambly, Lachine, across the Jacques Cartier River, across the Montmorency, and one just completed across the Chaudiere, a few miles west of Quebec. The builder of the last is of opinion that concrete dams, on account of their monolithic nature, are stronger than those of stone masonry, and (what is of great importance) that they can be built for half the cost of such dams. This would seem to be the case when it is considered that the dam across the Chaudiere River, which is 850 feet in length, 23 feet broad at the base, 20 ft. 3 in. high above the bed of the river, and thus as thick as it is high, cost but $200,000, with the adjuncts of a spill-way and an enclosure of double the height for the three penstocks to draw from, each of them upwards of 8 feet in diameter, running out and down the face of the cliff as at Niagara, in a way to give a head of 110 feet at the turbines.

Referring again to the Massachusetts dam over the Nashua at Clinton, which is to impound 63,000 million gallons of water, this dam, which at first sight appears of less thickness than that advocated by the writer, is in reality found to be equal, when allowing for its great thickness at the top, and its height—25 feet above the level of water in the dam. That is, it gives the requisite weight to duly resist any tendency to thrust it forward, and, moreover, two of its features are those already alluded to; it being specified that courses of masonry shall rise towards the downward face of the dam by 1 in 4, while the contract also requires that the making of horizontal beds of masonry shall be avoided, but that, on the contrary, the beds shall be stepped, and that in each underlying bed there shall be stones projecting in a way to become incorporated in the next course above.

REGISTER OF PATENTS.

Anti-Vibrator for Incandescent Gas-Burners.—Harris, W., of Chorley. No. 22,618; Dec. 12, 1900.

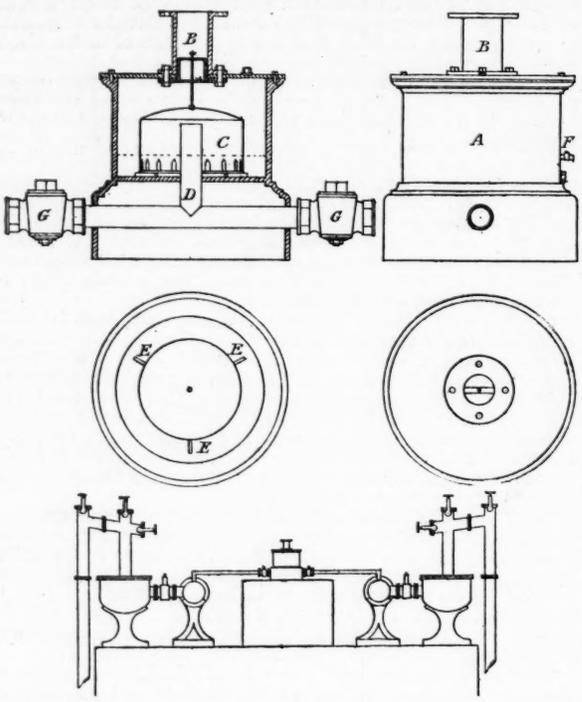


The patentee purposes to run a metal cup, having the lower part prepared for attachment to the gas-fittings, and with grooves or channels sunk on it from the outside of the cup, and extending round it. The upper part of the fitting consists of a cap of india-rubber material. This cover is also prepared for the attachment of the burner, and is preferably of a greater height but of a less diameter than the lower part. It has ridges or raised parts on the inner side, so that when the upper cover is applied to, and slipped over, the lower cup, the raised parts of the one coincide with the grooves or channels of the other. A gas-tight joint is thus formed; and the resilient cover, being in a state of tension, is incapable of transmitting the whole force of any shock which may be received below to the burner above.

Automatic Relief Apparatus for Hydraulic Mains.—Belton, J. C., of Chester. No. 1417; Jan. 22, 1901.

This invention consists in connecting the hydraulic mains to a relief-valve that opens automatically when there is a slight pressure in the mains, and closes immediately there is the slightest exhaust; the relief-valve consisting of a closed chamber provided with inlets and outlets, and containing water up to the desired level, and a bell whose lower edge dips into the water.

In explaining the object aimed at, the patentee remarks: The common practice, when stopping the making of gas—as when closing down for Sunday—is to run the exhauster until the charges in the retorts are nearly exhausted, and then close the hydraulic-main valves and slack-off the lids of the retorts. In some works, the retorts are left sealed, and a plug or cock is opened in the hydraulic or foul main to allow of the escape of any gas generated after closing the valves. These methods are objectionable and dangerous—objectionable on account of the great waste of gas they involve, the injury to the mouthpieces and lids, as well as the loss of temperature in the settings caused by the slacking of the lids and the resulting escape of flame and heat at the mouthpiece; and dangerous on account of the unavoidable admission of air to the pipes and hydraulic or foul main. As recorded in several instances, serious explosions have been caused through the accidental firing of this mixture; and invariably there is considerable depreciation of the illuminating power of the gas on re-starting the works, which is largely due to the admission of furnace gases by the cracking of the retorts resulting from their standing unsealed for so many hours. The apparatus to be described "enables the stopping and re-starting to be carried out with perfect safety from explosion, and with the least possible waste of gas or injury to plant, while the loss of illuminating power is inappreciable."



The construction and application of the invention is shown in the accompanying elevation and plan of the appliance, and an illustration of one method of erection.

The apparatus consists of a closed cylinder A, containing a bell C sealed in liquid, and standing when at rest on the supports E. The cylinder has a removable cover, to which is connected the outlet-pipe B. Attached to the crown of the bell is a rod passing through guides in the outlet-pipe. At the side of the apparatus is a cock F for regulating the depth of the sealing liquid, and a wash-out plug below. The base of the apparatus has an opening to admit the inlet-pipe D. To the horizontal portion of this pipe are attached the cocks G for connecting the apparatus to the hydraulic or foul mains. The vertical portion of this pipe passes through the opening in the bottom plate of the cylinder to the interior of the bell, where it projects above the sealing liquid. The essential parts of the apparatus are the closed vessel, the contained bell or cone sealed in liquid, and the inlet and outlet pipes, guides, and cocks attached thereto. The apparatus may be erected in any convenient position—preferably in the centre at either end of the retort-bench.

The action of the apparatus is as follows: When it is desired to stop making gas, the exhauster engine is gradually slowed down until the last charges put in the retorts are nearly burnt off; and the cocks G being opened, the engine is then stopped. As long as there is the slightest exhaust upon the hydraulic main, the bell of the apparatus remains at rest. Just before the engine stops, the valves on the condenser or foul main are closed; and the retorts not being unsealed, a slight pressure is set up in the hydraulic or foul main, which lifts the bell of the apparatus, and allows the excess of gas to escape. As long as sufficient gas is being generated to give the requisite pressure, it passes off by the relief apparatus; and it is unnecessary to open the retorts until the time arrives for re-charging them. The engine is then started at a very slow pace, which is increased as each retort is charged until the whole are at work. The relief apparatus closes automatically the moment pressure in the hydraulic main ceases.

Thus, says the patentee, the exhauster can be run to the last few minutes of the charges being carbonized, and started again when the first retort is charged. The retorts remain sealed, and a slight pressure is maintained in the retorts and hydraulic main, ensuring the exclusion of air and furnace gases. By the introduction of this automatic relief apparatus, it is claimed that several advantages are obtained. Waste of gas by the opening of retort-lids when stopping the engine is prevented, and the nuisance attending same is obviated. The exhauster is run longer, and re-started earlier, than is possible (with advantage) by any other system. The durability of the retorts, mouthpieces, and lids is enhanced by avoiding the practice of "slacking off," and the resulting coolness and cracking of the retorts. The temperature of the settings is maintained—enabling full duty to be obtained from the first moment of re-charging the retorts. Furnace gases are excluded; and by preventing access of air to the hydraulic or foul main, risk of explosion is avoided.

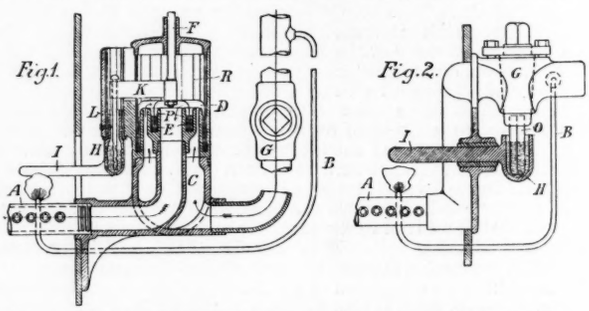
Removable Fronts for Gas-Heating Stoves.—Neil, A. & J., and Fletcher, Russell, and Co., Limited, of Warrington. No. 3082; Feb. 13, 1901.

This invention—consisting of a combination with the metallic sides of asbestos-ball gas-fires of a removable or partially removable front that can be placed and retained on the grate by projections, recesses, or equivalents on the edges of the front and corresponding parts on the inner edges of the grate, or hinged to the grate—was described and illustrated in the "JOURNAL" for Oct. 15, p. 974.

Automatic Safety Devices or Cut-Offs for Bye-Pass Gas-Burners.—Vaillant, J., of Remscheid, Germany. No. 15,907; Aug. 7, 1901.

The object of this invention is to provide a device by means of which gas can only issue from the illuminating or heating burners when the bye pass is alight.

Fig. 1 is a vertical section of one form of construction. Fig. 2 illustrates an alternative form of utilizing the heat from the bye-pass for safety purposes. Both are based upon the same principle of action. For purposes of illustration, it is assumed that the invention is employed in connection with a heating device in which a series of holes (in alignment or circular or other form) exist, from which the gas mixture exudes and is ignited; suitable means being provided by which this may be connected to the appliance.



The device has a tubular portion, the lower and preferably horizontal end of which is adaptable for connection with the burners A, while its upper and vertical end is adapted to form an annular groove or well E. The device is constructed so as to form a second annular groove or well, parallel with, and outside of, E; and above these is placed an inverted bell D, having two mouths, one dipping into the groove or well E, and the other into the second groove or well. The casing also forms around the vertical portion of the tube a chamber C having an inlet-mouth, to which is connected the gas-supply pipe governed by a tap or valve G, from which gas is allowed to enter into the chamber C. Beyond it is a gas-conduit B, which supplies gas to a bye-pass burner.

The annular grooves or wells are charged with water or mercury, so that while the mouths of the bell-valve D dip into them, a seal is formed, and gas cannot pass to feed the burners. The bell-valve is connected to a vertical rod F, adapted to slide in a vertical passage formed in the cover of the case, so that the bell-valve D may rise and fall in a chamber R. The rod carries an arm K, in the free end of which is a hole, in which may freely slide a vertical rod L, jagged, threaded, or otherwise irregularly formed at its lower end, which dips into a chamber H, partially filled with any substance that will set hard when cold and liquefy when hot—such, for instance, as crude paraffin

or other wax, lead, pewter, and the like. The chamber H is constructed to form, or has connected thereto, a horizontal projection I, which extends over the bye-pass burner, and may be heated thereby.

To close the apparatus from work, downward pressure may be exerted upon the rod F until the bell-valve D is in its lowest position, with its mouths dipping into the seals in the grooves or wells when (if the gas be turned off at the bye-pass burner until the substance in H is sufficiently cold to retain the rod L) the pressure on F may be released, as the bell-valve would be prevented from rising.

When the apparatus is placed in a position for working, the bye-pass burner is lighted, so as to make hot the projection I; and the heat conveyed from this to the chamber H liquefies the substance therein, and so releases the rod L. If now gas be turned on, the pressure would raise the bell-valve D into the chamber R, and cause the projection K to lift the now released rod L, and cause its mouth P to be raised out of the liquid or fluid in the grooves or wells E. Gas would then pass to the burners A in the direction of the arrows, and there be lighted by the bye-pass burner without gas entering the chamber R. When the heating apparatus is done with, it may be extinguished by turning off the gas at G, which may be any distance away; the bye-pass burner still remaining alight until next required. The turning off of the gas removes the pressure, and allows the bell-mouthed valve to fall into its grooves or wells again, and the rod L into its lowest position in the melted substance in H.

Fig. 2 illustrates an alternative arrangement of the chamber H, and means for dispensing with the bell-valve D. In this device, it is assumed that the gas-tap G is vertically disposed and adjacent to the chamber H; so that the lower end of the tap may have attached thereto, or be constructed to provide, a depending pin O, which dips into the substance in H. The gas in this arrangement passes direct when the tap G is turned on; but if, as previously described, the bye-pass light should become extinguished after turning off the gas, according to this device the solidifying of the substance in H would hold the pin O and prevent the turning on of the gas until the bye-pass burner was again lighted.

Gas-Stoves.—De Mare, F., of Brussels. No. 7711; April 15, 1901.

In order to derive the utmost advantage from a system of gas-heating, what must be done (according to the patentee) is to cause the whole of the air in the room to mingle with the hot gases, by a vigorous movement. The complete combustion of illuminating gas, however, generates steam, carbonic acid, and a few other secondary products in small proportions—the most objectionable being steam; and the mixing of the air does not cause it to wholly disappear. The excess of steam, it is proposed to deal with in the manner hereafter described.

Fig. 1.

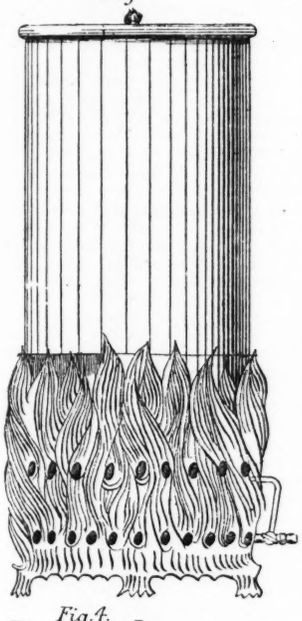


Fig. 1 is an elevation of a movable gas-stove constructed according to this invention. Fig. 2 is a partial vertical section of the top part of the stove, and showing a partial horizontal section of one of the plaster blocks placed inside. Fig. 3 is a horizontal section of the stove. Fig. 4 is a section of fig. 1, showing the arrangement of the openings and jacket for the burner-tubes. Within the stove-body is placed a burner giving either a blue or a white flame. In the latter case, the flames are filiform, in order to offer the largest possible surface so as to obtain "complete combustion." In both cases, the burner is composed of radiating tubular metal branches furnished with small steatite nipples decreasing in size from the periphery to the centre—that is to say, the peripheric flame will be longer than the flame from the nipple nearest to the centre of the burner. The branches (as a rule, six in number) are connected to a bell-shaped chamber, surrounding the gas-supply tube. It opens laterally towards the top of the bell, and is closed at the top by a conical plug, upon which the chamber can revolve. The bell is protected by a tube, which serves for the hydraulic joint necessary to ensure the mobility of the bell and for the obturation of the gas. The joint is made by a layer of mercury covered with glycerine. The radial branches are also provided with wings to guide the air to the flames.

Fig. 4.

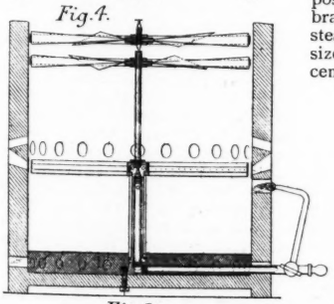


Fig. 2.

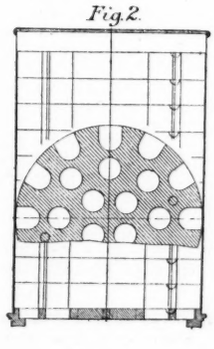
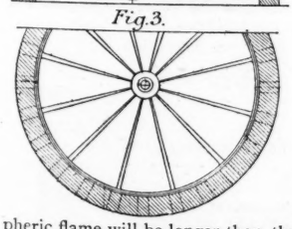


Fig. 3.



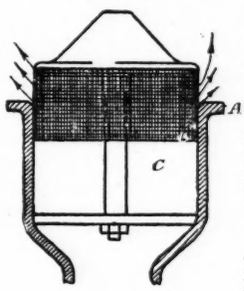
The chamber is extended vertically by an arm supporting a pallet-wheel, similar to those utilized in old-fashioned roasting spits; the wings being inclined so that the direction of the movement will cause the flames to be lengthened. Just above the wheel is placed a second wheel, with its pallets arranged in the opposite direction—thus perfecting the mixture of the air.

Before describing the second part of the stove, the manner in which the "calorific device" acts may be explained: At the base of the combustion chamber, there are orifices for the entrance of air, provided with metal gauze so as only to admit the quantity requisite for combustion. The gas arrives axially; then expands inside the bell; and is ignited at each steatite nipple. Under the influence of the hot gases, the lower-pallet wheel is rotated, and carries with it the bell and the whole of the combustion device; while the upper wheel revolves in the opposite direction, and mixes the combustion products with the outer air brought in through the openings above the gas-branches. The mixture of the combustion products at a high temperature with the cold air produces the desired mean temperature; the vapour being distributed in a large volume of air along with the other products of combustion.

It is necessary, however, to absorb the excess of vapour, and this is effected by the second part of the device. The drier is composed of porous blocks—preferably of moulded plaster—channeled and perforated, and contained inside a metal casing extending from the fire-box or lower part of the stove. They are placed in such a way that all the perforations are in one straight line, and the assembled parts thus form a tubular block through the whole height of which the warm gases pass. During this movement, the gases deposit their steam first on the first block. Then, when this block is heated, condensation takes place on the second, and so on. When the heat becomes so great that the upper block is hardly absorbent, it may be assumed that the temperature of the room will be high enough to prevent the steam from being condensed therein—it will, in fact, be carried into the outer air by the usual means of escape.

Incandescent Gas-Burners.—Killing, C., of Düsseldorf, Germany. No. 21,534; Oct. 26, 1901.

This invention has for its object to ensure that the mantle always occupies its proper position in the flame, so as to produce a maximum illuminating effect. For this purpose, the combustible gas and air mixture is caused to escape from the burner laterally and uniformly through a sheet of wire gauze, or an equivalent metallic sieve, the axis of which coincides with that of the burner. The lower part of the mantle is also guided by a rim or flange, or a series of projections formed on the burner underneath the cylindrical gas-outlet, or by increasing the diameter of the burner-top.



C is the cylindrical sheet of wire gauze or a finely-perforated metallic cylinder fitted to the burner, and forming an outlet for the gas and air mixture, as indicated by the arrows; while A is the rim or flange on the burner-top for guiding the lower part of the mantle concentrically with the burner.

APPLICATIONS FOR LETTERS PATENT.

25,659.—Askham, P. U., and Marlow, T. G., "Automatic feeders for conveyors." Dec. 16.
25,663.—Junkers, H., "Gas-engines." Dec. 16.
25,685.—Schonheyder, W. A. G., "Fluid meters." Dec. 16.
25,729.—Crossley, J. W., and Atkinson, J., "Gas-producer plants." Dec. 17.
25,782.—Atkinson, L. B., "Producer gas." Dec. 17.
25,812.—Roberts, A., "Connection for gas and water pipes." Dec. 18.
25,827.—Bewlay, H., "Expansion joints for water-mains." Dec. 18.
25,847.—Ransom, D. G. H., "Bunsen burners." Dec. 18.
25,991.—Kitson, A., "Vapour-burning apparatus." Dec. 19.
26,015.—Grafton, W., "Stop for inclined retorts." Dec. 20.
26,022.—Trocquenet, C., and Bap, F. P. G., "Gas heating-apparatus." Dec. 20.

Birkenhead Corporation Accounts.—The Borough Treasurer of Birkenhead (Mr. Lister Woodhouse), in his yearly report, states that the gas and water undertakings showed a profit for the twelve months ending March 31 last of £8540; but the working of the electric light undertaking for the some period resulted in a loss of £480.

The Rejected Birmingham "Omnibus" Bill.—At the next meeting of the City Council, to be held on the 7th prox., the General Purposes Committee will present a report setting forth the rejection by the ratepayers of the Corporation General Powers Bill. In the course of the report, the Committee say it is essential that power to work tramways on the termination of the current leases, to appropriate new lands for gas purposes, and some of the other objects of the Bill, should become law as soon as possible; and they therefore recommend that they should be authorized to prepare an amended draft Bill to include these and such other provisions as the several Committees, on reconsideration, may consider necessary for the proper administration of their departments, with a view to the draft being submitted to the Council not later than June next. This will give plenty of time for the measure to be studied by the ratepayers, and will thus remove what appeared the principal objection to the measure recently defeated on a poll.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Is there a Crisis in British Industry?

SIR,—Your article, and Mr. E. A. Harman's comments thereon, make very interesting and instructive reading. Personally, I am absolutely convinced that an acute crisis has arisen, not only as regards British industry, which may or may not prove to be of a temporary character, but also—and this appears to my mind to be much more momentous—in every respect, and underlying everything worth talking or writing about. According to my view of things, such a crisis has most assuredly arisen in British national character, which evidence proves has lost much of its old-time vitalizing strenuousness and honest intent, and corruption has, to an extent, claimed it as its own. All those letters to "The Times," &c., are so much utter nonsense, as they seek, as ever, to search for a scapegoat in the way of Trade Unions, workmen's foibles, &c., instead of truthfully going to the root of the matter. It is the same old game of trying to leave some other fellow with "the dog to hold." Workmen, generally speaking, regard kindness as a sign of weakness, to be accordingly imposed upon. Their consistent aim and wish is to become in the shortest time possible more *artful* than *clever;* for, being keen observers of men and things, they see only too plainly that the clever conscientious workman consistently gets "badly left."

Stony Stratford, Bucks, Dec. 27, 1901. W. H. BURTONSHAW.

LEGAL INTELLIGENCE.

Differential Prices for Gas.

At the sittings of the Wellingborough County Court on the 16th inst., the Rushden and Higham Ferrers Gas Company sued the Rushden Lightstrung Cycle Company for £7 odd for gas supplied. Mr. G. S. Mason, the Secretary of the Gas Company, said the action arose under peculiar circumstances. The Company are entitled by statute to charge 3s. 6d. per 1000 cubic feet for gas supplies; but a special arrangement was come to with the defendants whereby gas could be provided for motive power at 2s. 10d. per 1000 cubic feet—the condition being that a special meter should be used. The defendant Company had a meter fixed; but the contention of the plaintiffs was that the gas was used for other than motive power, and that therefore the full rate should be paid. Mr. George Denton, the proprietor of the defendant Company, said that there had been no difference in the practice of the Company since the meter was first put in—the gas having been used for heating as well as for motive power all through. His Honour Judge Snagge, after reading the Act obtained by the Gas Company, held that there was no defence, and gave a verdict in their favour.

Unlawfully Connecting a Gas-Meter.

A week ago, at Swadlincote Petty Sessions, two partners in a firm of engineers and ironfounders at Church Gresley pleaded guilty to "tapping" the gas-main on the 10th inst. Defendants stated that in consequence of replacing their gas-engine by a larger one, they applied to the Manager of the gas-works on Sept. 25 to have the meter taken out so that they could have an adequate supply of gas. Through the application being delayed, the works were without the ordinary gas power, which entailed a loss of £10 a day. In this dilemma, they disconnected the pipe attached to the meter, and though having tapped the main had offered to pay for the quantity of gas consumed. Counsel stated that the case had been brought as a matter of principle, as the District Council had the sole right to connect all meters. Defendants were each fined 7s. 6d. and 6s. costs.

Neglecting a Gas Cooking-Stove.

At Exeter last Tuesday, James Pitman was summoned by the Gas Company for 12s. 6d., damage done to a gas cooking-stove through neglect. A fitter named Lake testified that he went to defendant's house and found the three side plates of the stove and the second crown plate blown away by an explosion in the oven. In his opinion, one of the taps must have been carelessly left on. Mrs. Pitman told him that she sent her boy to put the kettle on the stove to boil; and just after he had done so, the explosion occurred. Defendant said he had satisfied himself that the explosion was the result of an accident, and was not caused by neglect. Therefore, under the agreement he was not liable. The Clerk informed him that he was liable under the Company's Special Act of Parliament. Mr. T. Cole, collector, stated that this was the first case of the kind the Company had had in connection with their slot meters; and they would not have made the claim had they not been satisfied the damage was the result of neglect. The Bench thought the Company should give their customers more information as to the powers they possessed under their Act of Parliament. There would, however, be judgment for them in this case for the amount claimed.

Gas Explosions in Electric Insulator Boxes.—A gas explosion in the conductor rail conduit of the Metropolitan Street Railway in New York recently blocked all the surface lines in the lower half of the borough of Manhattan for almost 24 hours. A broken gas-main had allowed a large quantity of gas to escape into the conduit, and when a spark from the collector shoe of a passing car ignited it, the covers of manholes and insulator boxes for more than a block were blown into the air. The burning gas destroyed the insulation of a group of five feed cables, breaking the circuit at the sub-station.

MISCELLANEOUS NEWS.

COLWYN BAY GAS ARBITRATION.

The Umpire's Award.

The award of the Umpire (Sir George Bruce) in the recent arbitration to determine the price to be paid by the Urban District Council for the undertaking of the Colwyn Bay Gas Company, was received last week. From the full report of the proceedings which appeared in the "JOURNAL" for the 10th inst. (p. 1540), it will be seen that the expert witnesses for the Company (Messrs. E. Herbert Stevenson, W. A. Valon, and Robert Porter) valued the undertaking at over £62,000; while for the Council Mr. W. R. Chester's valuation was £42,500, and that of Mr. Joseph Hepworth £45,800. The amounta warded is £54,706. It would thus appear that the Company's idea of the value of the concern was almost as much too high as that of the District Council was too low. Mr. Thomas Newbigging was the Arbitrator for the Company, and Mr. Corbet Woodall for the Council.

DEVONPORT GAS ARBITRATION.

Wednesday, Dec. 11.

The Arbitration to determine the purchase price to be paid by the Devonport Corporation to the Devonport Gas Company for their undertaking was resumed to-day, at the Surveyors' Institute—see *ante*, p. 1615. Mr. CORBET WOODALL, M.Inst.C.E., was Arbitrator for the Company; Mr. THOMAS NEWBIGGING, M.Inst.C.E., for the Corporation. Mr. JAMES MANSERGH, M.Inst.C.E., was Umpire.

Mr. *E. H. Stevenson*, M.Inst.C.E., examined by Mr. LLOYD, said the works were in a good situation for gas distribution; but the want of access by rail or canal was a drawback. The works themselves were the worst designed he had seen for a long time—in fact, the worst in England. He considered they were in many respects deficient for present supply. There was only accommodation for four weeks' coal storage; and he was of opinion that where the whole of the coal must be sea-borne, there should be accommodation for at least eight weeks' supply. He did not see where further coal storage could be provided, except where the gardens of the houses were now. The works, with the exception of the comparatively new portions, were in a bad state. He excepte1 the settings in the second retort-house, though he considered the retorts were badly arranged. One great disadvantage was the lowness of the roof. Without radical alteration, there was no possibility of working the retorts as they should be worked. There was insufficient retort accommodation, as was proved by the whole of them being constantly in use. It would be necessary to raise the roof of the second retort-house, and renew the whole of the ironwork above the retorts, which would cost between £4000 and £5000. Retort-house No. 1 also needed alterations. The condensers were of a very old type; while that in No. 2 house was very small.

Mr. BAGGALLAY admitted there was a deficiency in condensers.

Witness (continuing) said that the washers and scrubbers were deficient. The boilers were new and sufficient, and the engines were good; but one of the exhausters was too small, and the pumps did not seem to be doing their work satisfactorily. It was admitted that the purifiers were deficient. The gasholders also were insufficient, taking the maximum day's work as the standard. He placed the capacity of the holders at 753,000 cubic feet, as against 800,000 cubic feet calculated by Mr. Valon, and 811,000 cubic feet by Mr. Porter. He did not see how the deficiency could be met, except by removing one of the present holders, and building another of greater capacity. He did not consider the undertaking was of a stable character. It was doubtful whether, at the price of 2s. 6d. per 1000 cubic feet, the Company could continue to pay their maximum dividends. In the past they had done so, and had taken large sums out of the pockets of the consumers for building works. But they had done this from two causes: First, they had starved the works, not spending anything like what it was usual to spend upon repairs and maintenance; and, secondly, because during the past eleven years gas undertakings had had the advantage of the cheapest time for coal. It was in evidence that coal would not go lower than in 1900; and as far as calculations could extend, it had been found that, taking all the charges into consideration, including last year, colliery companies had not paid 5 per cent. on their capital during the last fifteen years. Coal would never go back again to its old price. From the accounts, it would be seen that the gross cost of coal in 1900 was 20d. per 1000 cubic feet; and in 1901 it was 30d.—a rise of 50 per cent. The rise in 1900 over 1899 was about 25 per cent. The great rise in the price of coke came in the year 1900, for the reason that most companies made their contracts in the late spring or early summer for the next twelve months. The rise in the price of coal came in the winter of 1900. In order to get at the net price of coal, therefore, it was not fair to take the high price of coal as against the low price of coke, because the latter fell before the former did. He presented the following table:—

Profit on gas in 1901, subject to a charge per 1000 cubic feet for repair of works and mains	£6,407
Deduct for repair of works and mains 5·5d. per 1000 cubic feet of gas sold, 227,036 × 5·5d.	5,202
	£1,205
Adjust for abnormal character of the year in respect of coal	2,223
	£3,428
Deduct for interest on mortgages, deposits, and loans .	1,244
Leaving balance of profit	£2,184

The net cost of coal in 1900, in Messrs. Cash's account, was 9·87d.; but this was too low, as he had explained, and therefore should be increased by 1d. per 1000 cubic feet, making it 10·87d. In a similar manner, the net cost of coal for 1901 should be decreased 1d. per 1000 cubic feet, making it 18·70d. The difference was 7·83d., and 227,036 × 7·83d. equalled £7407. From this had to be deducted the increased revenue obtained from gas—viz., £227,036 × 5·48d. = £5184; leaving the figure in his table £2223. Witness presented the following valuation of the undertaking:—

Maximum dividends	£1,400 × 25	£110,000
Deduct for deficiencies on the works:		
Coal-stores, 2700 tons	3,500	
Retorts and house	2,800	
Condenser in No. 2 retort-house . .	848	
Scrubbing apparatus.	650	
Exhauster	200	
Pumps in duplicate	400	
Purifiers	4,400	
Gasholder	10,070	
For extra weights required to the large holder.	176	
		23,044
Value of the undertaking		£85,956

In cross-examination by Mr. BAGGALLAY, witness admitted that the Company had been supplying gas at a low rate. In spite of the bad railway and water accommodation and the deficient storage, he had never heard of there being a shortage of coal. He believed all the work which was possible was being got out of the plant at the present time; and this increased the cost of working.

Mr. BAGGALLAY: We admit there has been some increased cost in working; but this appears in the balance-sheet, and already affects the balance, does it not?

Witness: Yes.

With regard to the retorts, does it seem an astonishing thing to you that on Nov. 27 1,093,000 cubic feet of gas, which is our maximum, could be made, using only 210 out of 261 retorts?—No; it is not astonishing to me.

That is, as the works stand at present?—Yes.

Therefore, they had a stand-by of 51 retorts on that day?—It would depend on what the retorts were. There may be 51; but they may be very poor retorts indeed—practically a negligible quantity. If they are in the new retort-house, they may be worth something as a stand-by; but what I based my statement upon was that last year you were only able to do a certain amount of work. I said this year the retorts had been improved, especially those which had been reset. Of course, 51 retorts out of 261 is a fair number as a stand-by.

As to gasholder capacity, you have estimated this at 753,000 cubic feet. It appears from the books that the Manager's figure is 808,000 feet?—I daresay. But you cannot get everything out which is in the holder.

Is it not the custom to record the amount which is stored?—No.

With regard to your figure of 5·5d. for repair of works and mains, you say that is because the works have been starved?—Yes.

If that is so, how do you at the same time justify the deduction for expenditure to put the works in order for the next thirty years?—Deficiencies are not depreciation. This is depreciation.

Under ordinary circumstances, in a district such as this, where you have not undermining or subsidence, or anything of that sort, is it not usual to take 4·5d. for the repair of works and mains?—It depends upon the district. In this district, I should say "No."

With regard to your correction for the price of coal, am I not right in saying that if you take the £2514 which Mr. Valon started with as the net profit, and are going to make an adjustment for the coal, and set off against that something on account of the rise in the price of coke, you would have to adjust this £2514 at the same time—that is to say, you would have to bring into it an amount equivalent to the rise in the price of coke?—I see your point; and I think you are right.

If that is so, it seems we can discard this rise in the price of coke, because it would have to come in on both sides?—No; one-half of it, because it is the comparison between the two years. I think the figure of difference should be 8·83d., instead of 7·83d.

Do you consider 25 years' purchase a proper figure?—Yes.

In Skipton, where you were on my side, we claimed 30·77 years' purchase of the maximum dividends; and the amount expended on surplus works was dealt with differently?—Yes.

Have you ever, for a statutory company, whether a maximum dividend or a sliding-scale concern, within recent years asked less than 28⅔ years' purchase?—I do not know that I have. I have never had such a company as this to deal with.

I see you have not included anything for compulsory sale. I suppose under the instructions of your clients, you look upon it as an agreement?—I do. I know there was an agreement; and the Company got very much better terms than they otherwise would have done.

Mr. CORBET WOODALL: If you spend this £23,000 on the works, could they be economical and satisfactory?

Witness: No; nothing would make the retort-house an economical one. You cannot get the coal into the bunkers without a lot of extra cost.

If it is true there is a margin of retorts available now, the £2800 you have deducted for retorts and house would be a sum available for repairs if the retort-house needed it?—Yes.

You speak of the gasholders requiring over £10,000 to bring them up to the level of the maximum day's make. How do you arrive at that?—By calculating the quantity of holder room required—viz., 373,000 cubic feet, and multiplying it by £27 per 1000 cubic feet.

When these things for which you make a deduction of £23,000 have been done, in what respect will this fall short of a well-secured undertaking?—First, in there being one large consumer; and, secondly, I doubt whether, if the works are properly maintained in the future, the Company could continue to pay their dividend.

You regard the War Office and the Admiralty as one consumer; but they are under separate management, and in different places?—Yes; but they work with each other.

Would you consider it serious to raise the price here?—Yes.

What are the points which, in your opinion, would make an undertaking likely to succeed?—First, good works, which have been well maintained, and rather more than sufficient in capacity for present needs. Secondly, an increasing consumption; whether moderate or not I do not mind, so long as it is appreciable.

First, the works are to be put right; and, secondly, you admit there is a very comfortable rate of increase?—The deficiencies upon these works are put down; but you cannot put back into the works what you have taken out of them.

I am only speaking of the £23,000. This being spent upon them, you have a proper works?—You have works of sufficient capacity for to day, and that is all. You have no excess; and you have a portion of the works which has been very badly treated. You cannot put back life which has been taken out. Then there should be a growth of the undertaking, spread over a considerable number of consumers, not largely due to one consumer.

Is there anything else?—I should take account of the past, and see how the Company have paid their dividend, and whether they have paid it under conditions which may or may not arise in the future.

Would you not consider the question of capital expenditure at all?—To a very small extent. I do not know that I should, unless the capital was very excessive. Then I should, because under those circumstances, as a general rule, I do not think you can charge sufficient for the gas to pay the full dividend.

What is the cost of the dividend per 1000 cubic feet in this case?—About 5d.

Suppose it were 10d., would you consider that a Company requiring 10d. for dividend was as secure as the one requiring 5d.?—Yes; it might be quite as secure.

You say the amount of capital does not weigh with you?—No; I say that where it is a moderate amount, it would not weigh with me. If it was immoderate, it would weigh with me.

What would you call a moderate capital for this Company?—About £600 per million cubic feet.

And what is it actually?—I believe it is about £350.

Is not that a very large margin with which to pay for any deficiency?—No; I think not.

Does the price of gas weigh with you?—To a certain extent.

Do you regard the price this Company charge as high or low?—It is a fairly low price.

Mr. *W. R. Chester*, M.Inst.C.E., in answer to Mr. FREEMAN, said he had adopted Mr. Stevenson's table with regard to the maintainable profit, which came to £2184. His valuation of the undertaking was as follows:—

Amount of dividends fixed by Parliament, £1400.

Capitalized at 25 years' purchase		= £110,000
Less deficiencies:		
Retorts	£2,500	
Repairs to retort-house	500	
Coal-stores	3,000	
Condensers	700	
Exhausters	250	
Scrubbers	700	
Pumps	250	
Purifiers	4,600	
Gasholders	9,900	
		22,400
Total value of the undertaking		£87,600

Mr. BAGGALLAY (in cross-examination): Would it make any difference in your views as to the insufficiency of retorts if it were shown that only the day before 1,028,000 cubic feet of gas was made, and that the old house was not used at all? It shows that, with a little care and management, a large amount more gas can be made (still allowing a certain amount of stand-by) than you were under the impression could be made when you came into this room?

Witness: No; I think not. It shows that on a given day a certain figure can be reached in excess of what can be produced on an average in a series of weeks in the winter months.

You put the stand by at 15 per cent. Have you got that at Nottingham?—Yes; more.

With regard to the question of your 5·5d. for maintenance, you are aware the meters are already dealt with in the agreed figure of £6407?—Yes.

Is not that a very much higher figure than you are in the habit of allowing in these cases?—Well, 5d. is the usual figure; but as you get works more remote from the supplies such as iron and fire clay, the figure must go up.

At Devonport they do not get their pipes from the Midlands, but from Glasgow by steamboat, which carriage compares somewhat favorably with railway carriage from the Midlands? Have you taken that into consideration?—No. It does not necessarily follow that the carriage would be less.

Mr. CORBET WOODALL: How much would it cost to rebuild the works on modern lines—wiping out the existing works and plant altogether? Do you think this could be done, and still keep within the £600 per million cubic feet.

Witness: Yes; I think it might.

The capital being low is a matter of importance to the purchaser and the vendor, because the amount required to pay dividend is low too. It is an element of security, is it not?—I think not.

Thursday, Dec. 19.

Mr. *Sidney E. Stevenson*, Manager of the works, who was summoned under subpœna, was called. In answer to Mr. FREEMAN, he explained that there were 253 retorts in all; and it was correctly stated in evidence that they were all generally under fire. The works, it was true, showed that a fewer number than the total were in use; but this was due to the fact that some three of the retorts had their mouthpieces pulled off by machinery, and were stopped up, and one set of sixteen mouthpieces was laid off for cleaning purposes. A few of the retorts were being scurfed; and the balance were stopped by choked pipes.

In cross-examination by Mr. BALFOUR BROWNE, witness said that his report to the Corporation on the condition of the works was made with the knowledge of the Chairman of the Company. The work which he considered should be undertaken was absolutely necessary; and it was work, moreover, that had been contemplated by the Company before going to Parliament. At the time the Company were having plans prepared for the work, and were proceeding to obtain estimates, the parliamentary proceedings put a stop to it. If they were to provide the necessary quantity of gas next winter, the extensions he had recommended were absolutely necessary, and should be commenced forthwith. He did not put the letter to the Corporation asking their consent to proceed with the work at once before the Chairman of the Company. But the letter-book was open to the Chairman; and, as a matter of fact, the next day the latter informed him that he had read the letters. As to the question of why the work was not carried through when the consent of the Corporation was given, witness said that, immediately the work was sanctioned, contracts were entered into; but the ironwork was so long delayed, that the retort-benches had to be put into operation before it arrived. Consequently, the various extensions could not be erected. In his own opinion, the expenditure required to put the undertaking in a condition of efficiency was £12,596. This sum included the alterations in the retort-house, raising the roof, and other work. As to the naphthalene trouble, they were at the present time engaged in clearing out the scrubbers and washers from this product.

This concluded the evidence.

Mr. FREEMAN then summed up the case on behalf of the Corporation. He dwelt upon the fact that, from the Corporation point of view, the works could never be made thoroughly efficient without practically being taken down and reconstructed. From the first, the buildings had been badly designed; and the best use had not been made of the ground. Some portions were wasted, and others unduly cramped. An important question was as to whether, when the works were in proper condition, they would earn such a dividend as to be absolutely reliable—as if they were the finest works existing in the country. If the Arbitrators adopted the figure that was put forward by Mr. Valon, they would have to assume this proposition. As to whether 5·5d. or 4·5d. was to be deducted for works and mains, this must depend upon their experience. The chief reason for the extra charge was that the works were not situated as favourably as some other works for getting iron and fire-clay, and that they had been allowed to go down in the past, and therefore the work would cost more money than if they were absolutely good at the present time. He was afraid Mr. Newbigging did not quite agree with Mr. Stevenson upon the point. But supposing the Corporation took the Company's figure and accepted the 4·5d., that would mean a difference, turned into revenue, of £946. Having arrived at this figure, still the question arose: Was there such a security for earning dividends as would represent 30·77 years' purchase of the concern? There were at least two strong reasons why there was not. In the first place, the £4400 was not an absolutely maintainable dividend. According to Mr. Stevenson's figures, in order to pay this sum the Company had only £3134; and if 4·5d. were taken instead of 5·5d., still the amount was only £4080. As a matter of fact, it was known that the Company only paid their dividend by borrowing money from the bank. This was a very important feature in dealing with the case. If in the future the Company could only pay their dividend by raising the price of gas—which, under the circumstances, would be an exceedingly difficult thing to do—then, upon this ground alone, it was not fair to say the income was so maintainable as to be paid for at the high price claimed. Counsel then proceeded to call attention to the fact of the Admiralty taking 25 per cent. of the gas, and read various letters showing the complaints they had made as to its quality, &c., and also threatening to get an electric installation of their own. Notwithstanding this, Mr. Valon had admitted that he had not made the slightest allowance for it in his valuation. Could it be said that the dividend was more fully maintainable than would be represented by 25 years' purchase? With regard to the debts owing by the Company, the Accountants both sides had met. They agreed that it was impossible to get anything like a complete account, because the books were not written up; but there was only one material difference between the parties on the question of principle. This related to the overdraft on the bank for the purpose of paying out the dividends. The Corporation ought not to pay this, because the Company should have paid their dividends out of their reserve fund. Had they done so, they would have had so much less in the reserve fund, which they now asked to keep, after paying the legal costs of the application at the Devonport Quarter Sessions and to Parliament. The balance they would put into their own pockets, under the Act. Supposing the Corporation were asked to pay, as a *bonâ fide* debt, the loan the Company had from their bankers? They would be paying the dividend, and at the same time they would be paying the same thing twice, because the Company kept the reserve fund.

Mr. BALFOUR BROWNE said there was a compromise; and one of the elements to be considered was any debt *bonâ fide* incurred. The debt to the bank was *bonâ fide* incurred. Mr. Freeman was wrong in saying they should have paid it out of the reserve fund, for sub-section 4 of section 5 said: "The existing reserve fund of the Company shall remain the property of the Company."

Mr. FREEMAN: The dividend was paid before the Act was passed.

Mr. BALFOUR BROWNE said that was so; therefore his reserve fund was full. It had not been depleted by dividends; and the bargain was that it should remain the property of the Company. It was clear that the dividend was not to be paid out of it, because the section continued: "The Company shall bear, and pay throughout, the whole of the costs, charges, and expenses incurred by them or on their behalf in connection with, and incidental to, the Recorder's proceedings, and also with regard to the Bill." The Arbitrators could not go behind the Act.

Mr. FREEMAN: I say you had no right to borrow from the bank, and therefore it is not a *bonâ fide* debt.

Mr. BALFOUR BROWNE said the section read: "All debts which are due from, and payable to, the Company shall be paid, satisfied, and discharged by the Company; and the Company shall indemnify the Corporation against the same, provided that the Company shall be entitled to receive the maximum authorized dividend on the capital of the Company from the date on which the dividend shall last have been paid up to the transfer—the dividend being paid for the purpose of this section as accruing from day to day." Therefore they were entitled to their maximum dividend. Where was it to come from? From the bank; because they could not go to the reserve fund, as they were to get that. Going to the bank was *bonâ fide*; and he asked the Arbitrators to allow it. Mr. Cash reminded him that the Company had a large balance, a credit carried forward on profit and loss account which was put in the bank, and they were drawing on that. This balance amounted to £9290.

Mr. FREEMAN: That was not at the bank.

Mr. BALFOUR BROWNE: It was in the undertaking. *Bonâ fide* meant not absolutely legally done, but properly done. Proceeding to sum up the case for the Company, Counsel said that it was unfortunate that in this particular case there were questions which did not often arise. The difficulty they were in with regard to Mr. Stevenson was not a common one. He was the Company's Manager; but he had been taken over by the Corporation. This was complicated by the fact that the Corporation were advised by Mr. Stevenson's brother. He never liked to mention these matters; but it was very unfortunate. He thought that Mr. Stevenson would have been well advised not to have made a report derogatory to the works of the Company to the Corporation without first of all submitting it to the Directors. There was another matter which was unfortunate. All the letters which Mr. Freeman had referred to from the Admiralty, signed by Colonel Kenyon, were inspired by Mr. Wright; and Mr. Wright was now apparently Gas Examiner to the Corporation.

Mr. LLOYD: Mr. Baggallay said Mr. Wright was a dock hand.

Mr. BALFOUR BROWNE said he was a dock hand; but he was the person who reported. He did not suppose Colonel Kenyon examined the meters in the dockyard. With reference to the value of the undertaking, as to the deduction, the parties were more at one than they were; but still there were serious discrepancies. The total as originally claimed by Mr. Stevenson was £23,044. The Company admitted there were deficiencies which amounted to £10,550. The question for the Arbitrators to decide was whether these deficiencies which were admitted were not made up by the surplus works that were in existence. That was the Company's claim. Even on the matters in dispute, the parties were coming close together. With regard to the condensers, there was only a matter of £100 between them. With reference to exhausters, the Company gave £50 more. As to purifiers, the figures were practically the same; and now that Mr. Stevenson had adopted their figures for the gasholder, instead of £10,070, it came to £8800, as against Mr. Valon's £5500. As to the coal-stores, it was said the Company should expend £3500. He could not understand why that was. There was storage for six average weeks' consumption. It was not like the case of some towns on the south coast, which had to depend on sailing vessels, which might be delayed. The coals were brought by steamers, which were practically as regular as a railway, and a good deal cheaper. Mr. Valon and Mr. Porter said, in their view, the coal storage was amply sufficient; and yet Mr. Stevenson wanted to write off the Company's value by £3500. According to the Corporation's valuation, the Company were to get less than the structural value of the works. The value of a going concern was not only equal to the structural value, but generally double. He asked the Arbitrators to come to the conclusion that the only deficiency in the works, and which ought to be taken out of capital, was £4400. This was more than met by the large surplus on the other side; and he asked the Arbitrators to say there was nothing to be deducted from the sum arrived at by the Company by multiplying the maintainable revenue. They started with the agreed figure of £6407. From this they were to deduct, according to the Corporation, 5½d. per 1000 cubic feet for repair and maintenance—viz., £5205. According to Mr. Valon, they had to deduct 4½d., which was £4259. The difference between the two was £946. Who was right? He submitted the Company were right, and that Mr. Newbigging had shown it by his examination of Mr. Stevenson. Mr. Newbigging showed distinctly that 5d. was the amount which, expended over the whole works, would reproduce the whole of the capital. Mr. Stevenson was really claiming for deficiencies of works three times over. He claimed it first by the 5½d., because he said sufficient had not been spent; he claimed it secondly in the £23,000 to make up deficiencies; and he claimed it thirdly by writing down the number of years' purchase from 30·77 to 25. That was entirely wrong. If the Company were right that 4½d. was the correct amount, away went £946 of Mr. Stevenson's valuation. Including meters, 5d. was the right figure to take, and away went the whole difference between the £5205 and the £4259. As to the adjustment with regard to coal, Mr. Stevenson took the net cost of coal at 9·87d., and claimed he was entitled to a further 1d. on the net cost of coal for 1900. He proceeded to justify this by raising the price, as shown in the Accountants' table, from 9·87d. to 10·87d., which gave him the increase he wanted—and the £946. Immediately afterwards, he reduced the net cost of coal in 1901 from 19·7d. to 18·7d.; and therefore he got the 1d. twice over. With perfect candour, when this was pointed out in cross-examination by Mr. Baggallay, he acknowledged the error, and deducted £946. Away went the second of Mr. Stevenson's £946. He left, however, a claim in his valuation of 1d. per 1000 cubic feet—another £946, which could only be sustained on the ground that, at the present time, coke was realizing an amount less per ton of coal carbonized than it did in the year 1900. If this were wrong, away went the third £946. And it was wrong. Everybody knew it. Coke was not realizing less per ton of coal carbonized now that it did in the account year. All these three sums of £946 each amounted to £2838, which, added to his balance of profit (£2184), gave £5022. This was £1 more than Mr. Valon's figure. Mr. Valon showed, after making all proper rectification, that there was an amount of surplus maintainable profit for the year of £621; and the whole of the difference between Mr. Valon and Mr. Stevenson was gone. The Company might have gone further, and claimed more than this for the surplus, because it was proved that, since 1901, 8s. per ton had been the reduction in the price of coal whereas the net increase over the year 1901 was 7s. 4d. If they had claimed the difference, it would have amounted to a further 1d. in the price per 1000 cubic feet sold, and would have given a further £946 of surplus. But the Company rested entirely

upon the figures first put in, showing that the £4400 was well secured. If further capital had been raised instead of being taken out of revenue, the purchase price would amount to over £210,000. Therefore the consumers got back the money which had been taken from them. In another case, Mr. Stevenson had said that the worse the Company was managed the better it was for the purchasing body, because there was less profit, less value, and less of everything, and they could make it good. Mr. Stevenson ought to have said the same thing in the present case. There might be a moral question involved in advocacy; but there could be no question about the immoral nature of advocacy in the witness box. If the statement were true of Skipton, it was true of Devonport. Counsel had to rake through books to find inconsistencies where there ought to be none. Gentlemen should be prepared to say the same in each case. Mr. Stevenson also said there: "It is to the advantage of the purchaser to purchase works which have not been worked properly, because all the improvement which he makes with his capital goes into his pocket; whereas, if you have made all these improvements, we have to buy them off first." Then all the question of prejudice as to the condition of the works went by the board, and they came back to the question: Was the income maintainable? He thought he had shown that it was. He asked the Arbitrators to come to the conclusion that these matters of prejudice had nothing to do with the case, and that the income which the Company had been getting, with the correction for coal, was well secured. The last matter was the allowance for compulsory sale. The Company were forced to sell. There could be no question about that, although, of course, they took the best terms they could; and he asked for the usual 10 per cent. addition. The amount of debts and liabilities would have to be added to whatever sum the Arbitrators arrived at. The Accountants could not give the figures now; but they would be able to give some—leaving the one question as to whether the Company should have taken the money out of the reserve fund to pay the dividend, or whether it was a debt *bonâ fide* incurred. It was agreed that, although the purchase was as from the 1st of January, the Company were to remain in possession until the money was paid; and they were to get 4 per cent. interest on the amount awarded from Jan. 1.

Mr. LLOYD said that was agreed.

Mr. *Cash* was then called. He gave the figures which he had agreed to with Mr. Drew as far as they had gone, and said that the remainder would be sent to the Arbitrators about the middle of January. Where the figures could not be agreed upon between them, alternative amounts were to be given.

This concluded the proceedings. The Arbitrators' award will be given in due course.

FROM LLANELLY TO RHYMNEY.

Mr. Albert R. Cawley is about to sever his connection with the Llanelly Gas Company (of which concern he has been Manager and Secretary since the latter part of 1897) for the purpose of taking up the general managership of the Rhymney and Aber Valleys Gas and Water Company. The course of Mr. Cawley's work for the first-named Company has not by any means been over smooth places. Financial, labour, and other difficulties blocked the way to the placing of the business on a strong base; dividends evidently being elevated head and shoulders above all other considerations. Small wonder, then, that, when the coal boom came, the Company were unable to meet the pressure without raising the price of gas no less than 10d.—from 3s. 10d. to 4s. 8d.—per 1000 cubic feet; and the charge still stands at the 4s. 8d. When Mr. Cawley took the management of the works, the make of gas was 7500 cubic feet per ton of coal, and of 10 to 12 candle power, from Scotch coal, Wigan cannel, and South Wales coal. For the last twelve months, there has been an average production of 10,000 cubic feet per ton of 15-candle gas (the standard being 14 candles) from South Wales coal alone; the use of Lancashire and Scotch coals and cannel having been discontinued. This, and the improved production, effected considerable economy. The works themselves were apparently in a queer condition when Mr. Cawley took them in hand; and his successor will find things somewhat different from what they were then, though not in the condition that a little more liberal expenditure would have brought them to, or that Mr. Cawley would like them to be in. Among other peculiarities, formerly the hydraulic mains had midfeather plates within to give a seal of 4 inches on the dip-pipes, the foul main to the condensers was inclined the wrong way and half full of tar, the exhausters were fixed on the outlet of the scrubbers and not on the outlet of the condensers, and so, to have a level gauge at the hydraulic, the exhausters were worked at 8 inches vacuum. All this has now been changed; and the present is the most comfortable winter's working out of the five that Mr. Cawley has had at Llanelly. There is still plenty of work to be done to bring the plant up to what will satisfy a gas engineer, and meet his ideas of what results should be in order to maintain his own reputation.

Now Mr. Cawley is going to take charge of an undertaking the area of which will produce him ample scope for his energies. His new appointment is as General Manager of the Rhymney and Aber Valleys Gas and Water Company, which was incorporated in 1898, and will operate over an area of 80 square miles in Breconshire, Monmouthshire, and Glamorganshire—embracing the areas of six District Councils, and an existing population of about 80,000. Five gas-works and six water-works have been purchased and amalgamated, and new reservoirs are in course of construction at the head of the main valleys. A 50-million gas-works is to be erected at the bottom of the valleys, on the completion of which the present gas-works will be discontinued as far as carbonizing is concerned, and be employed only for storage and as governor yards and district depôts; the gas being sent from the lowest to the highest—a distance of 20 miles, and a difference in level of 700 feet. The supply of water is the most pressing at present, as, during the summer months, it is very scarce, and cottage property is being rapidly built, owing to the sinking of new coal-pits in what is practically a virgin steam-coal field. We congratulate Mr. Cawley on his change; and shall watch with interest the development of the Rhymney and Aber Valleys Company under his management.

ROYAL COMMISSION ON COAL SUPPLIES.

An official announcement was made yesterday that a Royal Commission has been appointed to inquire into the question of the coal supplies of the United Kingdom. The following are the terms of reference: "To inquire into the extent and available resources of the coalfields of the United Kingdom; the rate of exhaustion which may be anticipated, having regard to possible economies in use by the substitution of other fuel or the adoption of other kinds of power; the effect of our exports of coal on the home supply and the time for which that supply, especially of the more valuable kinds of coal, will probably be available to British consumers, including the Royal Navy, at a cost which would not be detrimental to the general welfare; the possibility of a reduction in that cost by cheaper transport or by the avoidance of unnecessary waste in working, through the adoption of better methods and improved appliances, or through a change in the customary terms and provisions of mineral leases; and whether the mining industry of this country, under existing conditions, is maintaining its competitive power with the coalfields of other countries." The Commission is constituted as follows:—

The Right Hon. William Lawies Jackson, M.P., J.P. (Chairman), Chairman of the Great Northern Railway Company.
Sir George John Armytage, Bart., F.S.A., Chairman of the Lancashire and Yorkshire Railway Company.
Sir William Thomas Lewis, Bart., D.L., J.P., F.G.S., M.Inst.C.E., M.I.M.E., Civil and Mining Engineer, General Manager of Lord Bute's property in South Wales, Chairman of Colliery Companies.
Sir Lindsay Wood, Bart., M.A., J.P., M.Inst.C.E., M.I.M.E., Chairman of the Durham Coal Trade Association, Managing-Director of Collieries
Thomas Bell, Esq. (of Messrs. Pyman, Bell, and Co., coal exporters, Newcastle-on-Tyne).
William Brace, Esq., Miners' Agent, Secretary Monmouth Western Valleys District South Wales Miners' Federation.
Arthur Currer Briggs, Esq., Chairman and Managing-Director of Henry Briggs, Son, and Co., Limited, Whitwood, Normanton, Yorks.
Harold Baily Dixon, Esq., M.A., Professor of Chemistry and Metallurgy in the Owens College, Manchester.
James Stedman Dixon, Esq., Mining Engineer and Coalmaster, President of the Mining Institution of Scotland, and President of the Institution of Mining Engineers of Great Britain.
Clement Le Neve Foster, Esq., D.Sc., B.A., F.R.S., Professor of Mining in the Royal College of Science, South Kensington, and late one of His Majesty's Inspectors of Mines.
Edward Hull, Esq., M.A., LL.D., F.R.S., lately Director of the Geological Survey of Ireland.
Charles Lapworth, Esq., LL.D., F.R.S., Professor of Geology and Physiography in the Birmingham University.
Joseph Paton Maclay, Esq. (of Messrs. Maclay and M'Intyre, Ship Brokers, Glasgow).
Arthur Sopwith, Esq., F.G.S., Manager of the Cannock Chase Colliery Company, Limited, Brownhills, Walsall.
Jethro Justinian Harris Teall, Esq., M.A., F.R.S., President of the Geological Society of London, and Director of the Geological Survey of the United Kingdom.
Ralph Young, Esq., Secretary to the Northumberland Miners' Mutual Confident Association.

Mr. William Russell, Barrister-at-Law, 1, King's Bench Walk, Temple, will be Secretary, and Mr. John Swanwick Bradbury, of the Treasury, Assistant Secretary, of the Commission.

PROJECTED GAS LEGISLATION FOR LONDON.

Saturday, the 21st inst., being the limit of time allowed by the Standing Orders of Parliament for the deposit, in the Private Bill Office of the House of Commons, of copies of Bills to be introduced next session, we are able to indicate more fully the scope of the two measures relating to the supply of gas in London than was possible when the "Gazette" notices were published.

South Metropolitan Bill.

The object of the South Metropolitan Bill is "to empower the Company to acquire additional lands for the manufacture of gas and for other purposes of their undertaking; to make other provisions as to the testing of the gas of the Company; and for other purposes." The preamble states that the Company was incorporated in 1842 for "more effectually lighting with gas certain places within the borough of Southwark, and other parishes and places in the counties of Surrey and Kent;" and it then goes on to set forth the history of the undertaking down to the passing by Parliament of the Bill of last year, in which provision was made for lowering the illuminating power of the Company's gas from 16 to 15, and eventually to 14 candles, with a corresponding reduction in the standard price. Reference is next made to the arrangement embodied in the Company's Act of the past session for the transfer to them, by agreement, of that portion of the undertaking of the Gaslight and Coke Company south of the Thames, subject to a proviso that no such agreement should have effect unless the latter Company obtained, in the then ensuing session, power to raise additional capital. It is now deemed expedient to repeal the limit of time so created; and as the demand for gas is increasing, the Company wish to acquire certain lands specified, in order to construct on a portion thereof additional works for the manufacture of gas and the conversion of residual products. The Company also desire to have the provisions of the Gas-Works Clauses Act, 1871, with respect to the testing of gas, made applicable to the gas supplied by them, in lieu of those now existing. Finally, it is proposed to ask for authority to increase the Directors' remuneration, owing to the extension of the business.

Coming to the clauses, the first sets forth the short title of the Act;

the second incorporates the Lands Clauses Acts and the Gas-Works Clauses Act, 1847, except section 31 (relating to the formation of a reserve fund out of surplus profits); and the third is the interpretation clause. The next clauses are to empower the Company to divert and stop up a portion of Blackwall Lane, and purchase additional lands compulsorily within three years after the passing of the Act. The succeeding clauses give power to purchase lands by agreement, put a restriction upon taking houses of the labouring classes, limit the period for the completion of the diversion of Blackwall Lane, and authorize the construction and maintenance of gas-works on the lands scheduled, but on no others. Clauses 14 to 16 relate to the gas-testing arrangements. It is provided that from and after Sept. 1, 1902, the gas supplied by the Company "shall be tested in accordance only with the provisions of the Gas-Works Clauses Act, 1871," and the Act now applied for; and the parts of the General Act headed respectively "Testing of Gas" and "Penalties" are to be incorporated with, and form part of, the new Act. The prescribed testing-places are to be those at present in use—one for each station for manufacturing gas; and in case of a change in any station, the substituted testing-place is to be on a leading main not less than 18 inches in diameter from which the supply of gas is taken, and at a distance not more than two miles from a manufacturing station. The burner is to be that prescribed in the Company's Act of 1900. Nothing in the new Act is to be deemed to repeal or alter the statutory provisions regulating the illuminating power, price, or quality of the gas supplied by the Company. With regard to the tests for purity, the apparatus is to be that now in use. It is provided that the test for sulphur compounds may be made at any time; and the result of the testing is to be evidence of the amount of sulphur "on the day in which the testing was commenced, and irrespective of its termination." The quantity of sulphur other than sulphuretted hydrogen permitted in the gas is not to exceed 22 grains in 100 cubic feet on an average of six days at any station; the quantity of ammonia, not more than 4 grains per day in a like bulk of gas. A day is to be calculated from nine in the morning of one day till nine the next morning. Under clause 16, the Company are to compensate the Gas Referees and the Chief Gas Examiner for the loss of emoluments which may accrue to them respectively by reason of the provisions of the Act in regard to testing; the amount to be seven years' purchase of the sum paid by the Company towards their fees in respect of the year ending June 30, 1902. Clause 17 amends section 3 of the Company's Act of 1901 by specifying that it is to be construed as if the words "in the ensuing session of Parliament" had not been inserted. The next clause deals with the remuneration of the Directors. It is proposed that from and after Dec. 31, 1902, the sum to be paid per annum to them shall not exceed £5000, until the annual quantity of gas sold is upwards of 12,500 million cubic feet, when it may be increased to £5500; and when it exceeds 15,000 millions, it may be further raised to £6000, beyond which it is not to go. The final clause provides for defraying the costs of the Act.

Commercial Gas Bill.

The Bill to be introduced by the Commercial Gas Company is mainly to enable them to convert the capital and debenture stocks into stocks of other nominal amounts, but yielding equivalent amounts of dividend or interest, and to empower them to raise more money. The preamble sets forth that the Company was incorporated by an Act passed in 1847, with the object of "making and supplying gas within certain parishes and places therein mentioned in the City of London, and certain parishes and places then in the County of Middlesex but now in the County of London, with a share capital of £150,000, and power to increase the same to £200,000 by additional share capital or by borrowing. After citing the Acts relating to the Company and their undertaking which have since been passed, the preamble goes on to state that the Company's present capital consists of £550,000 of 10 per cent. stock, £280,000 of 7 per cent. stock (£28,125 of which is unissued), and £300,000 of 4½ per cent. debenture stock, of which £253,287 has been issued—making in all £830,000 of capital and £300,000 of debenture stock. It is deemed expedient, as mentioned above, that these stocks should be converted into stocks of other nominal amounts, but yielding equivalent amounts of dividend or interest. It is also desired to reduce the illuminating power and standard price of gas, raise more capital, which it is proposed to offer in the first instance to consumers of gas supplied by, and to employees of, the Company, acquire further lands, and alter the dates for holding the general meetings of the shareholders.

The first three clauses are the short title, incorporation, and interpretation clauses. The next one provides that demands under £50 may be recovered in the County Court. Clause 5 deals with the conversion of the capital stocks. On and from Jan. 1, 1903, the £550,000 of 10 per cent. stock is to be converted into 4 per cent. stock of the nominal amount of £1,375,000, which is to be divided in the proportion of £250 for each £100 of stock; and the £251,875 of 7 per cent. stock actually issued, into 3½ per cent. stock of the nominal amount of £503,750, to be divided in the proportion of £200 for each £100 of stock. The power to create £28,125 of 7 per cent. stock is to apply to £56,250 of 3½ per cent. stock. By clause 6, the £253,287 of 4½ per cent. debenture stock is to be converted into 3 per cent. debenture stock of the nominal amount of £379,930 10s., which is to be divided in the proportion of £150 for each £100 of stock. The unexercised power to create £46,713 of 4½ per cent. debenture stock is to apply to £70,069; and it is to be issued rateably with, but after, the £56,250 above referred to. Clause 7 enables the Company to register the new capital and debenture stock, in lieu of the existing stocks, in the names of the parties entitled thereto. The next clauses deal further with the stocks, which are to be transferable only in amounts of £5 and multiples thereof.

In clause 12, provision is made for varying the illuminating power of the gas and the standard price and dividend. On and after Jan. 1, 1903, the prescribed illuminating power of the gas is to be 15 candles, and the standard price 3s. 5d. per 1000 cubic feet; and on and after July 1, 1907, the former is to be 14 candles and the latter 3s. 4d. If the Company desire to accelerate the second reduction of illuminating power, they are to be at liberty to do so from any 1st of January or July, on giving three months' notice to the London County Council and to the Town Clerks of the several Metropolitan Borough Councils in their district, as well as by advertisement in one London daily and one local newspaper. If during any part of a half year the price is raised 1d. or less, the dividend on the 4 per cent. stock is to be reduced by 1s. 4d. per cent., and by 1s. 8d. on the 3½ per cent. stock; but if, during the whole of a half year, the price shall have been lowered by 1d. or less, the dividend is to be increased by the above-named amounts. The burner for testing the gas is to be Sugg's "London" argand; and in making the test it is to be so used as to give a light equal to 16 candles. But when the illuminating power is lowered to 14 candles, the burner is to be used with the chimney prescribed by the Gas Referees for gas of this power. Within two years after July 1, 1903, the Company are to supply suitable burners gratis to the ordinary consumers, and, as soon as reasonably practicable, but within a period of twelve months at the latest from that date, they are to exchange those used by the "slot" meter consumers. Notice of the last-mentioned provisions is to be given on each demand note of the Company sent out during the period.

The next group of clauses relates to the raising of additional capital. The Company will ask for power to raise such a nominal amount as will be sufficient to produce (including premiums) £375,000 of 4 per cent. stock. The unissued stock is to be first offered to the Company's consumers and employees at the average market price, but in no case lower than 5 per cent. below it. Stock not taken is to be put up for sale by auction or tender; and any not sold is to be offered to the holders of capital stock. The Company will ask permission to borrow on debentures any sums not exceeding in the whole one-third of the additional capital which they have at the time actually raised. Any employee of the Company between the ages of 16 and 21 is to be allowed to acquire an interest in the profits of the undertaking by way of part remuneration for his services. Agreements entered into before the passing of the Act will be confirmed by it.

The remaining clauses relate to the purchase of lands not to be used for manufacturing purposes, the taking of houses inhabited by the labouring classes, the sale or lease of lands, and the meetings of the Company. Instead of having the half-yearly meetings as now in April and October, it is proposed to hold them as soon after June 30 and Dec 31 in each year, but, in any case, not later than the above-named months, as the Directors may determine. The qualification of the Directors and Auditors is to be increased from £1000 and £300 to £2500 and £750 respectively. The final clause provides for the payment of the costs and expenses of the Act.

THE FATAL ACCIDENT AT JARROW.

Inquest on Mr. Whyte.

An inquest was held at Jarrow last Saturday week into the death of Mr. W. S. Whyte, the Manager of the Jarrow station of the South Shields Gas Company, who, as briefly recorded in the last issue of the "JOURNAL" (p. 1659), was fatally injured while superintending the erection of a crane on the Company's quay. Andrew Manson, a labourer, said that he assisted to erect the crane. Large stones were used as counterbalance weights; and when the crane was up, the deceased saw it, and was apparently perfectly satisfied with it. Michael Brannen, foreman, stated that Mr. Whyte made an inspection of the crane, and could find no fault with it. There would be about 1½ tons of stone on each leg. The crane was started on Tuesday afternoon, for the purpose of raising coal in a basket capable of holding about 5 cwt., from a craft to the quay. Mr. Whyte was present, and saw the work commenced. A basket of coal was raised to about 18 inches above the quay. When the jib was just over Mr. Whyte's head, witness saw it was coming down, and he shouted to the deceased to get out of the way. He was too late, however; and the jib caught Mr. Whyte about the back of the neck, knocked him to the ground, and pinned him there. The crane overbalanced apparently; and this caused the jib to fall. The counterbalance weight stones tilted, and the legs went up. He did not know about any bolt being missing from the bottom of the crane. There was a pin in when the crane was erected. He was not quite confident that there was no defect in the plate where a bolt was wanting. There might have been a flaw, but witness did not observe anything wrong. The Coroner said it was a most unfortunate case, but to whom could they attribute blame but to the deceased himself? It seemed that the counterbalance weights had been badly placed, thus causing the crane to come down. The work had evidently, in its erection, been entirely approved by Mr. Whyte. The Jury returned a verdict of "Accidental Death."

Mid-Kent Water Company.—At the tenth annual meeting of the Company, which was held recently, the Chairman (Major B. T. L. Thomas) gave an account of the progress of the undertaking during the past year, and stated that a further increase in revenue was expected in the coming year. The recent issue of shares had been applied for four times over. Dividends at the rate of 6 and £4 4s. per cent. were declared on the original and new ordinary shares respectively.

Incandescent Lighting at Deptford.—Incandescent lighting has again scored over the electric light as a means of illuminating large areas in foggy localities by the decision of the Cattle Markets Committee of the Corporation of London, after a lengthened experiment at their market on the south side of the river, which is particularly liable to fogs, with several kinds of high-pressure gas and oil lighting, to adopt it. So brilliantly lighted have the lairs and cattle-sheds been at night, that it would have been possible, had it been necessary, to continue the ordinary work of the market at night. The Committee have been so satisfied with the results obtained, that at the last meeting of the Court of Common Council they asked for authority to enter into a contract with the Kitson Lighting Company to lease an installation of incandescent oil-lamps for three years for lighting the roadways and open areas of the market, at an annual cost of £680; and to purchase for the internal lighting of the bullock lairs, 18 Lucas incandescent gas-lamps, at a cost of £108.

GAS HELPS THE ELECTRIC LIGHT.

One of the many uses to which gas lighting, once spoken of as "defunct," is being put is to help its rival the electric light—in quite a friendly way, of course—especially where the latter is supposed to light the streets of the City of London with 2000 (so called) candle power lamps. The City of London Electric Lighting Company are under contract with the Corporation of London to light the principal thoroughfares with arc lamps of the above-mentioned description; but the extremely foggy weather of the present winter has so often swooped down on the City, and caught these brilliant (?) specks of light blinking and spluttering, and finally obscured them, that the powers that be, in the form of the Streets Committee, have had to consider what could be done to "assist the lighting" of the main thoroughfares, where the traffic is so great at some of the busy crossings. Two of the most important crossings have been selected for the purpose—one being the space by Queen Victoria Street and the Embankment, the other Ludgate Circus at the intersections of Farringdon Street, New Bridge Street, Fleet Street, and Ludgate Hill. At the first-named crossing, four high-pressure gas-lamps have been connected to the mains supplying the lamps on Blackfriars Bridge. Two of the lamps have been fixed in the refuges by the District Railway Station; and so light has this spot, which has been stated to be the "most dangerous crossing in Europe," become, that it is now possible to cross in comparative safety during the dark hours. Before these brilliant lamps were fitted up, there were, and are still, five so-called 2000-candle power lamps in the immediate vicinity, which only seemed to "make darkness visible." The new system has been installed by Mr. Charles Carpenter, Chief Engineer of the South Metropolitan Gas Company, at the request of the Corporation. The lamps on the refuges are fitted with four burners, each consuming 10 cubic feet of gas per hour; and they have an illuminating power of about 1300 candles each. The other position selected (Ludgate Circus) has been fitted up with five lamps, each consuming 30 cubic feet of gas per hour, and giving a light of 1000 candles. Strange as it may appear, these lanterns have been fixed, one on each quadrant of the Circus, and one at the eastern end of Fleet Street, sandwiched between the electric light columns of the City Company, to aid them in dispelling the darkness. In this case, the pressure is obtained from a "Sugg ram," fitted in a small chamber and attached to the water-main in the underground lavatory at the corner of New Bridge Street. The work has been carried out by Messrs. W. Sugg and Co.

BELFAST CORPORATION BILL.

The Regulation of Gas and Electric Light Fittings.

At a Special Meeting of the Council of the County Borough of Belfast, which was held on Monday of last week—the LORD MAYOR (Sir Daniel Dixon) presiding—for the purpose of considering the Bill which the Corporation propose to promote, and in which, among other things, they seek power to make bye-laws regulating gas-pipes and electric light wires in buildings and to hire out electric motors (*ante*, p. 1389), a deputation representing the electrical and gas-fitting trades attended to express their views on the matter.

Mr. RICHARD PATTERSON, J.P., who acted as spokesman, said that both trades which he represented had embarked a large amount of capital in plant, machinery, and stock. In reading over the newspaper advertisement of the Bill that was to be introduced in Parliament in the coming session, they learned with considerable alarm that their trades might be very seriously affected by some of the clauses. Therefore, they deemed it right to state their objections to these paragraphs. He need hardly say that the gentlemen for whom he spoke would very much rather not be present on this occasion; but they appeared in self-protection. They did not object to the raising of the standard of work, and they were all glad to see work done not in a jerry way, as was often the case in various trades. They would aid the Corporation in every way if they laid down a certain high standard of work. But when the Corporation had supplied electrical current or gas, their work should cease. They objected to the Corporation doing work of any kind which would interfere with their trades; and they had come to the determination to oppose these clauses, which seemed to affect them, both before the Council and possibly in London. They, however, hoped that some arrangement would be come to which would obviate such a proceeding. Their first objection was that any Corporation trading was, and must be, a monopoly; and they knew what this meant. They objected also to the paragraph refusing to give electrical current except under certain conditions. Any merchant who had put up a plant of his own could be refused current from the town centre; and this was objectionable. They were also opposed to the clause dealing with the hiring-out of motors. The trade were prepared to hire these; and they objected to the Corporation doing so. Besides, the rapid changes that took place in the construction of electrical appliances would make the motors scrap and obsolete in a few years. The Corporation had recently applied to the Local Government Board for additional borrowing powers in connection with the electrical undertaking; and the Board objected to the hiring-out of electric motors; reducing the amount of the loan in consequence. This, to a certain extent, had been evaded by saying that the motors would be supplied out of revenue instead of capital. He was, however, prepared to state that the trade would meet the requirement, and hire out any motors that were necessary. The number used in the city was very small: and consequently it would be unfair to the larger proportion to tax them for the minority. What the Committee appeared anxious to do was to supply so much current during the day as would reduce the cost all round during the day and evening. This might be done by making the whole electrical system a little more popular, not by putting too many restrictions on the public. Belfast stood higher as regarded the class of work done than almost any other city in the empire; and although they would approve of a high standard, they did not want it so high that it would prevent people from putting in electricity. He hoped the Corporation would reconsider the matter, and that they would either erase or modify the objectionable clauses, which would be injurious to the trades he represented.

Mr. JOHN DOWLING supported what Mr. Patterson said. He considered that the Corporation should not go further than to supply the gas-meter or the electric-meter. The ratepayers had a right to say what they wanted, and to point out what they required in the way of pipes and fittings. If the clauses were adopted, the Corporation might simply take over their trades and give them compensation. If they went to the gas depôt at Ormeau Avenue, they would find tons of stoves lying in different parts of the building, which were now nothing but scrap metal; and the ratepayers were paying for this.

Councillor LIDDELL said he was interested in the inspection of gas-fittings. The intention of the Bill was not to dictate where these fittings should go; but it was necessary that, when they were put in, a Corporation inspector should see that they were perfect before tenants entered the houses.

Councillor F. C. JOHNSON asked whether there were any firms in Belfast who were in a position to hire out electric motors as well as supply them.

Mr. PATTERSON said they were all willing to do so, but they had not been asked.

The LORD MAYOR was sure the Corporation would give the views expressed by the deputation every consideration. They would not do anything that would hurt any trade.

The deputation having retired, the Council proceeded to consider the Bill.

Alderman JOHN M'CORMICK, in moving that the measure be promoted, said he did not see any very strong distinction between the hiring out of an electric motor and the hiring out of a gas stove. With regard to the supply of current to those who had plant of their own, the Corporation ought not to be made a stand-by for particular traders. The section enabled the Corporation to enter into any equitable arrangement by which these persons would take a certain supply during the year.

Councillor YOUNG, in seconding the resolution, said there was no intention of interfering with electricians or gas-fitters; and it was to remedy an illegal state of things in regard to the hiring of motors that the clause was inserted in the Bill. The current used, however, in this way was almost double what it was before. They had 6000 gas-stoves let out; and thus much more gas was burned than if the Corporation had not embarked on this matter. The regulation in regard to gas fittings was to ensure the safety and health of the people.

After some discussion had taken place, the Corporation approved of the general principle of the Bill, and left the clauses to be discussed in Committee.

MANCHESTER GAS UNDERTAKING.

Progress in the Past Year.

We learn from the "Manchester Courier" that the work of the Corporation Gas Department has proceeded energetically during the past year. Renewals and repairs have been thoroughly executed, and new plant of various sorts has been provided as required at the several gas-works. At Gaythorn, improvements have been made in the settings of inclined retorts and in the purifying plant, with good effect; and the whole of this station is in good condition for supplying future demands. At Rochdale Road, the re-arrangement of works rendered necessary by the unfortunate explosion which occurred rather more than two years ago, and the scheme of reconstruction then adopted, have been proceeding vigorously. The new offices for foremen, the placing of meters in one house, and the concentration of the various shops and tools for carrying on the work of the station, will greatly aid in efficient and economical operation. A fresh set of purifiers is approaching completion. The old and obsolete coal-testing plant has been demolished; and the operations hitherto carried on therein will be transferred to Bradford Road. Most important work has been done at the latter station. The testing plant referred to, which is now finished, forms a complete and interesting small gas-works, and will be used for the perfect testing of all coal offered or supplied under contract, as well as in times of stress for the manufacture of gas. The plant for the manufacture of sulphate of ammonia is also practically finished, and in working order. This plant is up-to-date, and furnished with modern improvements for the prevention of nuisance and the working up of the ammoniacal liquor produced at all the works; and it is expected to add considerably to the profits of the department. Much of the building alterations and extensions have been done by workmen in the employment of the Committee. The public lighting of the city has been improved to some extent by the substitution of incandescent lights for the old-fashioned flat-flame burners. This system of lighting will no doubt in the near future be further extended, and possibly improved. A striking instance of improved lighting is to be found in Piccadilly, where an installation of intensified gas has been for some time under test. There is an illuminating power of 10,500 candles in the installation, which supplies 35 burners. By and by there will be a report upon the consumption of water and gas necessary there, and the consequent cost of this particular form of illumination. At Poland Street, the headquarters of the Street Mains and Lighting Department, have been erected spacious rooms for the repair of gas-cookers and other plant; and testing-machines have been laid down, by which all pipes received from contractors are thoroughly tested before laying them in the ground. The year has been a busy one in the laying of mains and service-pipes, as the demand for gas has arisen in districts in which large building operations are being carried on.

Atmospheric and climatic conditions have been most varied; but the demand for gas has been fairly well met, with the exception of two or three days of an invasion of intense fog, such as has not occurred for ten years, which sent in the usual influx of complaints. Difficulties were, however, soon overcome. It is true that the naphthalene "fiend" made its appearance for a time; but even that has been laid, and the

gas consumers of the city may take comfort in the thought that, while in Manchester this "fiend" gripped his few scores, in some cities he prevailed over his hundreds, and in others over his thousands. The mystery of naphthalene is all the greater when it is remembered that precisely the same gas passing through different mains and into different districts is variously affected by the plague. This is also the case with adjoining houses. Sudden variations of temperature, and the more or less exposure of pipes and meters, seem to be the chief causes of the trouble, which as quietly goes as it comes—literally where and how it listeth.

With reference to the consumption of gas, it is found that from the beginning of the year up to the end of October last, this did not equal the consumption of the corresponding period of last year. This is partly accounted for by the comparative mildness of the season, although further to some extent by the increase in the price of gas and the reduced cost of coal. From Nov. 1 last, however, up to the present date, there has been a steady weekly increase, which has established so far a comparative increase of about 2½ per cent. On the densely foggy Monday, Nov. 25, 24,697,000 cubic feet of gas were consumed, which required about 2500 tons of coal, or its equivalent, to produce. When it is remembered that this invasion of fog was sudden and unexpected, and such as had not visited the city for at least ten years, it will be seen that the resources of the works were well equal to the occasion, and that the 130,000 gas consumers had little cause to complain. The year has passed without serious accident, and is closing in a most propitious manner for the department.

The week ending on Christmas Eve was a record one for the undertaking; the quantity of gas sent out from the works having amounted to 154,160,000 cubic feet. To produce this, about 15,000 tons of coal would have to be carbonized. To convey this weight of coal from the pits to the gas-works, nearly 1900 railway trucks would be required; and to propel this number of loaded trucks, the combined efforts of almost 100 powerful locomotive engines would be necessary. The previous record of 147,744,000 cubic feet was made in the week ending Dec. 23, 1899.

LANCASTER GAS AND WATER SUPPLY.

In a review of municipal affairs in Lancaster during the year now closing, the "Lancaster Guardian" of last Saturday gave the following particulars concerning the Gas and Water Departments of the Corporation: "The net profits from the gas undertaking were £2091 9s. 2d.; being £518 0s. 10d. less than for 1899-1900. Compared with that year, the receipts from the sale of gas show an increase of £2575 10s. 6d., and the price of residuals also increased by £1213 18s. 11d. But against this, coal cost £3049 0s. 9d. more. The balance was disposed of by transferring £1000 to the borough fund and £1091 9s. 2d. to the gas reserve fund. In 1898, the Committee paid for coal 10s. 7d. per ton. The average price now is 14s. 1d., which is 3s. 6d. more than it was on the old basis, when gas was sold at 2s. 6d. For the year ending March, 1900, the Water Department handed over in relief of the rates £3288 11s. 4d. The net profits for the year ending March last were £3141 10s., or £147 1s. 4d. less than in the previous year. This difference is more than accounted for by the item of bank interest. For the year ending March, 1900, this alone amounted to £1540 6s. 6d. During the year there had been spent on the Blea Tarn scheme £12,324 8s. 2d., which reduced to £664 9s. 6d. the interest received from the bank. The income from the sale of water was £524 15s. 3d. in excess of the previous twelve months; while the expenditure on special mains was nearly £1000 in excess of the preceding year. Blea Tarn is now practically complete, and the cost is well within the estimated amount. Thanks to the foresight of Alderman Huntington (Chairman of the Water Committee), Lancaster did not, during the drought of the autumn, suffer any inconvenience, and was the envy of many towns in the North."

ELECTRIC LIGHTING NOTES.

It is proposed to introduce electric lighting into Dingwall; and the latest scheme contemplates utilizing the tidal flow of the Dingwall Canal and River Peffrey for the motive power. The total capital outlay is estimated at £4000.

The Borough Council of Stoke Newington are adopting a novel means of securing electric light for their district. The borough is the smallest in the Metropolitan area, and as it has been felt that the installation of generating plant and the erection of works would entail a considerable burden, the Council have decided for the present to buy electricity in bulk from the adjoining boroughs, and then distribute it over the district. The Borough Councils of Hackney and Islington have agreed to supply the electricity.

The Chairman of the Shrewsbury Electric Lighting Committee (Alderman Deakin), on the starting recently of some new machinery, gave a few particulars as to the progress of the undertaking. He said that in three years the consumption has grown from 66,747 units to 210,008 units; while the number of consumers has increased from 99 to 250. Financially, also, the concern is doing very well; for though the loans are for short periods, compared with many public loans, and no less than £1400 has to be paid off each year, it is hoped that the profit on the works during the past year will cover this sum. In the first twelve months of the Council's management, the profit was about £800, leaving £600 to be paid out of the rates.

At a meeting of the Electricity Committee of the Manchester Corporation on the 23rd inst., some information was forthcoming as to the progress of matters at the new generating station in Bloom Street, which has been designed to accommodate four engines, each of 3000-horse power. The first engine was promised by the Sub-Committee to be ready for work on Nov. 1 last. It actually took up part of its load on Oct. 28, three days in advance of that date. The second engine, which was to have been ready by the beginning of February next, has been the subject of strenuous exertions, night and day, for some time past, with the result that it is now in daily use. This addition to the generating power of the station will enable the department speedily to meet the wants of customers now waiting for current to the extent of over 50,000 8-candle power lamps.

It is stated that an attempt is to be made by the Board of Trade next session to deal with the muddle caused by the overlapping of powers which confer on various companies and local authorities the duty of supplying the Metropolis with electrical illumination. Owing to the careless drafting of the original Provisional Orders, there already existed a state of great confusion prior to the passing of the London Government Act; but the alteration in boundaries brought about by this measure, has made confusion worse confounded. The idea of the promised Bill is to re-adjust electric lighting areas so as to make them as far as possible coterminous with the areas of local government as fixed by the Act of two years ago. This, however, does not seem to be such an easy matter as it looks, for there are rival interests to be considered; and the Board of Trade fully realize that it may be necessary to deal exceptionally with many parts of the areas affected.

A protracted sitting of the Bognor Urban District Council was held a few days ago, for the purpose of considering the plans, specifications, and estimate prepared by Mr. J. Enright for providing electric light in the town, and of making application to the Local Government Board for sanction to a loan of £12,000 to carry out the installation. Discussion on the question was initiated by the Chairman (Mr. H. N. Travers), who replied in detail to criticisms passed on the scheme. He compared the benefits of electric light with what he termed the "antiquated" system of gas, pointed out the successful experiences of other towns, and urged that by adopting the scheme Bognor would not only be keeping itself abreast of the times, but would be introducing a cheaper and far superior light, and would be giving the town an undertaking the profitable nature of which was practically assured. It would be an undertaking which would, he said, be a benefit to the town in the near future and to posterity. He moved that application be made to the Local Government Board for sanction to a loan of £12,000. Mr. W. Tate seconded the motion. The Rev. W. D. Yoward led the opposition to the scheme, and, in the course of a long speech, contended that the Chairman had failed to prove that the undertaking would be a valuable asset to the town, or would be the blessing to the people which he seemed to think it would be. He challenged the Chairman to name three places in the whole country, of similar size and situation to Bognor, where electric lighting on the plan proposed was proving a financial success. The speaker cited the cases of many towns where such undertakings had proved anything but successful, and mentioned several which had practically given up electric lighting in the streets in favour of using incandescent gas-lamps. He appealed to the members of the Council to pause before they doubled the debt of the town, and concluded by severely criticizing various details in Mr. Enright's scheme. Mr. Long said he should not vote for the scheme until the ratepayers signified by a majority that they wished it to be carried out. He moved that a poll be taken. After a protracted debate, this amendment was carried by six votes to four.

As announced in last week's "JOURNAL," the electric light installation of the Maidstone Corporation was inaugurated with suitable trumpeting on the previous Thursday. The actual switching on was performed by Mrs. Vaughan, the wife of the Deputy Mayor; and then what followed is described by a local journalist in language and manner before which we must bow. He says: "Maidstone came out in great force, and stood about the High Street waiting for the new light to come. Suddenly the light appeared, and there were exciting scenes. A rocket which went high into the sky, and discharged coloured fire, let those in the country around know that the supreme moment had arrived. High Street, illumined by electric light, is a revelation. To say it is as bright as day would be overstepping even legitimate journalistic exaggeration; but it is safe to say that the effect is a noteworthy one. Even the pale, cold lustre of the moon turned yellow. Was it on account of the density of the atmosphere or through jealousy? When the light appeared, the Invicta Band, at the request of the Mayor, played the National Anthem and 'Rule Britannia,' &c., and then marched through the streets playing inspiring music." After such tall writing, it is interesting to receive from an independent source a letter, in which the writer remarks: "There is a fairly general dissatisfaction with the arc lights, which are charged £20 per annum each, and seem to be put out about midnight." This and other signs point to the great momentary jubilation of Maidstone being turned hereafter into a prolonged regret. At the opening ceremony, the Deputy Mayor stated that "it was very satisfactory for one to feel that the new illuminant has already been so well taken up." But, in face of this, it rather astonishes one to find, in the estimates which the Finance Committee presented at the meeting of the Council the previous day, that the total calculated receipts of the undertaking for the next six months—including, we presume, the arc lights—are put at £800 and the expenditure at £2262—a deficiency of not less than £1462, and for six months only! At the present time, the electric light costs the Highways Committee an additional £230; and the two items will represent something equivalent to a 3d. rate. When the glamour of Maidstone's new possession has passed off, we expect to hear a repetition of the discontent which we have heard from other places. In the meantime, the Council, who we take it are mostly business men, have a little lesson to learn in one of the elementary business principles. When making purchases, one usually expects (and we have no doubt that Maidstone councillors are the same) to obtain a quantity cheaper than a single article. As the Council, they were the customers of the Gas Company, who, now that they are deprived of 114 lamps in the electric lighting area, have very naturally decided to raise their charge for the upkeep (cleaning, lighting, &c.) of the smaller number of lamps by 2s. each, making it £1 5s. 3d., and £2 17s. for gas—the Company's argument being, we fancy, that they can deal with the larger number at a cheaper rate per lamp than the smaller, besides which they are deprived of the profit from the 114 lamps. However, the Council have resolved not to accede to the proposed increase. As the contract for lighting the street-lamps expires to-day, it will be interesting to see what attitude the parties will adopt.

IPSWICH WATER SUPPLY.

Local Government Board Inquiry.

An inquiry, on behalf of the Local Government Board, was held at Ipswich last Friday week, by Mr. E. A. Sandford Fawcett, Assoc. M.Inst.C.E., into an application of the Town Council for sanction to borrow £20,240 for water-works purposes—mainly in connection with the construction of a new reservoir. The proposal was explained by the Water Engineer (Mr. Hamlet Roberts), who said that the supply was derived partly by gravitation and partly from deep wells in the chalk. He measured the gravitation supplies a year or two since at about 122 million gallons per annum; while the quantity pumped last year was nearly 357 million gallons. The present reservoir accommodation on the high service was about 1½ million gallons in two reservoirs; and there was also a third reservoir, into which the gravitation supply flowed, capable of containing 500,000 gallons. The present storage capacity in the high-level reservoirs was only equal to about one day's maximum, leaving no margin in case of breakdown. He had for some time urged upon the Committee the importance of providing increased accommodation; and with a view to this, the Corporation had acquired the land immediately adjoining the present reservoirs on the Park Road —which was the highest point in the whole borough—as a site. Under the directions of the Committee, he had prepared a scheme and plans, &c., for the construction of a third high-level reservoir, capable of containing about 4 million gallons. In December last, this scheme and plans were submitted to Mr. James Mansergh, M.Inst C.E., whose report fully bore out his suggestions and recommendations to the Committee. It was explained by the Borough Accountant (Mr. Arthur Pearce) that the income of the undertaking for the year ending March, 1894—being the first complete year in which it was under the management of the Corporation—was £12,537. This had increased, until last year it was £15,605. Since the date of the purchase, the Corporation had spent upwards of £19,853 in providing new pumping machinery and testing-room, and in the replacement of small worn out pipes by those of larger size, and extensions of mains to new districts. A large proportion of this expenditure did not bring increased revenue, but was necessary in order to meet the requirements of consumers. After the inquiry, the Inspector viewed the site of the proposed reservoir.

GUERNSEY WATER SUPPLY.

Agitation against the Guernsey Water Company.

A question of great importance to the shareholders in the Guernsey Water Company is down for discussion at the next meeting of the States of the Island. In consequence of the exceptional drought, the Company have lately been sorely tried, and have not fully met the demands of their customers. To have done so was practically an impossibility. The situation in Guernsey is a peculiar one, as the Company have a sudden heavy demand for about five months to supply the fruit growers, who consume an enormous quantity just when the supply is most needed for domestic purposes. The discussion has been fostered in the shape of a "*requête*," signed by several prominent officials. The petitioners complain that the supply of water is irregular and insufficient, and that the service is badly organized. They point out that when the Water Company, in 1887, applied to the States for a concession, in order to undertake the necessary works for the supply of water, the scheme was referred to a Committee, who recommended its adoption, adding the opinion that such water supply service would prove an immense advantage to public and private interests. But, instead of this, the petitioners state that it has been the means of causing large losses and serious inconvenience. Having given particulars in support of this statement, they urge that the matter deserves careful examination by the States, and suggest the appointment of a Committee to determine and report upon the following propositions: (1) Whether, through failure to supply proprietors and house occupiers with a sufficient quantity of pure and wholesome water, the Company have not forfeited the monopoly conferred upon them by the concession; (2) Whether, in the public interest, the States should not give due notice to the Company, in accordance with Article XXXIV. of the concession, with the object of compelling them to relinquish the concession in favour of the States, together with such real and other property as the Company may possess; and (3) In the event of the States accepting in principle the idea of acquiring the concession, to suggest the best means of providing the necessary capital for the purchase of the undertaking as a going concern.

In an interesting letter addressed to the "Guernsey Advertiser," the Manager of the Company has replied to the various allegations in the petition. He says it can be proved that the irregularity and insufficiency of the supply complained of was not due to bad organization, but to the drought. To assert to the contrary is misleading. He points out that the Company have not the advantage possessed by English water companies, of having their water laid on in all the inhabited houses in the town. Had a larger number of householders taken the water, the Company would not have been obliged to turn to the greenhouse proprietors for custom. But in St. Peter-Port householders will not have the Company's water, possibly from motives of economy. Though the States have not compelled occupiers of houses to purchase water from the Company, the first thing they would do, if they bought up the concern, would be to endeavour to coerce such occupiers into taking the water from them, whether they liked it or not, and so would lay upon them a new rate, in addition to those already looming in the distance. Instead of having to deal with a Company doing their best without compulsory powers, the townsmen would have a master; and most people know whether such a master would be desirable. This, the Manager says, is the cloven hoof which is carefully concealed from view in the *requête*; but he urges that it is right that the public should be reminded of it from the start of the discussion. He concludes by calling attention to the fact that during the time the Company have been in operation in the Island, the Directors have endeavoured to keep pace with the demand. They have every year been either sinking new wells or enlarging the capacity of their old ones; and at the present moment they are making a seventh well, which they fully anticipate will turn out of great value. If the States do acquire the water-works, they can do no more than the Company have done and are doing, unless, of course, they refuse to supply greenhouses, and make it compulsory for householders to take the water.

BRIXHAM WATER SUPPLY.

A meeting of the ratepayers of Brixham was held last Wednesday week, to consider the question of water supply. At a previous meeting, a proposal to obtain a supply from the Paignton District Council, who are carrying out a gravitation scheme with its source on Dartmoor, was rejected, and a Committee appointed to act with the Council in the improvement of the local supply. Mr. W. J. Bradden, the Chairman of the District Council, who now presided, explained that after the last public meeting they learnt that the Paignton Council were prepared to reconsider the terms they had offered. Accordingly, a deputation went to Paignton and had obtained a favourable decision. The Clerk (Mr. Arlidge) read the report of a Committee of the District Council. From this, it appeared that the Paignton Council were prepared to enter into a perpetual lease to supply water in bulk for the use of Brixham; the minimum supply to be 75,000 gallons per day, and the price 6d. per 1000 gallons, subject to a discount of 15 per cent. This concession of a discount of 15 per cent. practically reduced the price to 5d. per 1000 gallons. Mr. Vanstone, who had been consulted by the Council as an expert, was of opinion that the advantages of the Paignton scheme were in every way manifest. The water would be delivered at a level which would supply all parts of the district, and pumping would be entirely unnecessary; while the quality of the water was unexceptional. The cost of constructing a reservoir to hold 300,000 gallons, and of other necessary works, would be £3500. With this scheme, the Council would also be in a position to supply neighbouring villages, and a part of the district which was excluded from the local scheme. A guarantee of £50 a year for twenty years had been obtained from Lord Churston, to whom the supply was expected to be beneficial in the development of his estate. It was anticipated that the annual cost of the scheme would be £1383, as compared with £1630 for the local reservoir scheme; the charge to the ratepayers being 2s. 3d. in the pound, as against 2s. 8½d. for the local supply. The Ratepayers Joint Committee recommended the adoption of the scheme, and this was supported by the District Council, subject to the term of the supply being for fifty years, at the expiration of which period the Local Government Board be asked to arbitrate and determine the conditions and period of a new agreement, if any. It was stated that Paignton would guarantee a supply by February, 1904. The meeting unanimously decided in favour of the Paignton scheme.

WATER SUPPLIED FROM DARTMOOR.

The Devonport Bills.

It was decided by the Devon County Council, last Thursday week, to present a petition against the Bill to be promoted next session by the Devonport Water Company, empowering them to construct a reservoir on Dartmoor. The Company's supply is derived from the River Cowsic, on Dartmoor, and flows through an open leat to a reservoir within a few miles of the town, whence it is piped. It is now proposed to construct a storage reservoir at the intake on the River Cowsic, and for this purpose to acquire 379 acres of the forest of Dartmoor. Mr. R. H. Watson, in moving that the Dartmoor Preservation Committee be authorized to take the necessary steps to obtain *locus standi*, remarked that the Bill said nothing about compensation water; while it was believed that one effect of the scheme would be to divert the course of the stream which supplies the convict establishment at Princetown. It was a question whether the Devonport Water Company had any necessity to go to this spot for water. Six miles nearer Devonport there was the Plymouth reservoir at Burrator, where there was an abundant supply of water; and if the amalgamation of Plymouth and Devonport ever took place, there would be no need for the scheme. Another fact to be considered was that, if the scheme were carried out, nearly 9 miles of roads would be disturbed by the laying of mains, which in itself would be a serious encroachment on the forest of Dartmoor. Mr. Spear, M.P., although anxious that the interests of the public in Dartmoor should be preserved, thought the Council would be ill-advised if they put any serious impediment in the way of Devonport getting a plentiful supply of water from Dartmoor. Some steps should be taken with regard to the question of compensation water; but he hoped the difficulties would not be insurmountable. Mr. Windeatt, on the other hand, thought the Council ought not to go out of their way to give assistance to a private Company to get a Bill through Parliament, so that they might obtain a profitable commodity. The Devonport Water Company had not in the past acted fairly with the Council or the Board of Trade, with reference to the provision of fish-passes on the river, and had not kept faith in previous transactions. There was a Bill to come before Parliament on behalf of the Devonport Corporation, which provided for the purchase of the rights of the Company; the Corporation being of opinion that the Company should not have the increased powers they asked for. Mr. Hurrell thought the Devonport Corporation were well able to look after themselves. All the County Council had to do was to see that the Company, in taking water, did not interfere with the rights of other towns. The Earl of Morley, the Chairman of the County Council, said that perhaps the Devonport Corporation might want as much looking after as the Company. It was decided that the Committee should take the necessary steps in the matter, and should watch the county's interests both as regards the Company's and the Corporation's Bills.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

When these notes reach the public eye, the first year of the new century will be passing; the world will have reached one of those points of time at which its inhabitants take note of their past doings, in the hope of finding in their experiences help for the tasks that lie before them. I suppose it will be generally conceded that this has not been a year of great things in connection with gas supply; but nevertheless it has been a good vintage year. While there has been nothing of outstanding distinction, there has been a general increase in the demand for gas. The industry is year by year taking a firmer hold upon the minds of men. Gas is becoming more and more indispensable in many processes, commercial and domestic. This conclusion is highly satisfactory; and it is not detracted from by the circumstance that the success which is attending the efforts of gas engineers is not the result of accident or other outside influence, but arises from the quickened efforts, in recent years, of those inside the profession. There is more activity in the gas world to-day than there ever was before—a progressive activity, and not merely motion in a circle. There is a decided trend of opinion in gas matters, by which the forward movement is set forth and made manifest. There are more gases to choose from than there used to be; and there are more processes of manufacture than were known even a few years ago. But these varieties of process and product, while they have widened the working area, have, in fact, been one of the causes which have led to a narrowing of the objects of the gas producers. The power to choose gives the opportunity to specialize; and that gas comes to be selected which is believed to be most suitable for the purpose in view. Gas makers thus, serving only one interest, are freer to improve their product than they were when the only gas was an illuminating one. This is, perhaps, somewhat academic; but, on reflection, it will be found to be an observable feature of existing gas supply. A more easily seen direction of the motion is to be found in the cheapening of the products of gas-works. It is only a few years since machinery began to be introduced into retort-houses; already there is scarcely one of any considerable dimension which is not equipped with some labour-saving plant. By means of this, the price of gas has been brought down; and it is becoming common belief that it will be possible to further lower it by reducing the illuminating power. This is already suggested in several places in Scotland. These proposals are probably the best indication of how far Scotch gas managers have travelled within the past few years. As a matter of fact, gas managers are on this point, as their duty is, ahead of the public. They are more anxious to get the power to effect a reduction than the public are willing to give them it. Consequently, in some places, it has been found necessary to adopt means for bettering the gas by the addition of enrichers. These, happily, can be had in more than one form; and thus again the adaptability of gaseous products to the needs of the world is made manifest.

Among the movements which I may recount as having taken place in Scotland during the year, are the following: A very large extension to the gas-works at Dundee was completed. An almost entire reconstruction of the Johnstone Gas-Works was also finished. The new gas-works at Perth were inaugurated in April; and the manufacture of the entire supply of the city was then transferred to them. Very good progress has been made with the erection of the new gas-works for Edinburgh and Leith at Granton; the chemical works and one holder being already in use, and the retort-house being practically completed. In Glasgow, the erection of mammoth gas-works at Provan has also been prosecuted vigorously; but a great deal yet remains to be done. A gasholder was inaugurated at Stirling in February. New gas-works have been built in Cowdenbeath, to take the place of works which were burned down about two years ago. Large extensions to the Coatbridge Gas Company's works were inaugurated in March. The erection of entirely new gas-works is in contemplation at Falkirk and Peebles. This may not be an exhaustive list; but it is a good record for a small country like Scotland.

The undertaking of the Newport (Fife) Gas Company was transferred in October to the Town Council. The Corporation of Glasgow have acquired the undertaking of the Milngavie Gas Company. A transfer to the Corporation of the Carnoustie Gas Company was almost effected; but after terms were nearly agreed upon, the Town Council failed to carry the confirming resolution by a two-thirds majority, and the negotiation fell through. There was a proposal for a transfer at Bo'ness; but it is still in the initial stage of consideration by a Committee.

The Doune Lighting Company and the Largs Gas Company were registered as joint-stock companies.

The price of coal has been falling during the whole of the year. Taken all over, the published quotations show a reduction of about 1s. 6d. per ton; but prices for long contracts are more favourable to buyers. There was no trouble with the miners, thanks to the operation of a Conciliation Board; and supplies gave no anxiety.

Gas workers pressed their claims for higher wages in Edinburgh, Aberdeen, and other places; but the times were against them, and they derived little, if any, advantage.

The price of gas was advanced in most towns; but in several—particularly Alloa, Perth, Dunfermline, Hawick, Peterhead, Rothesay, and St. Andrews—reductions were effected. The cheapest gas in all Scotland is at Alloa, where the price is 2s. 4d. per 1000 cubic feet.

The weaving of the chequer work of the century has begun; but the death roll is not yet heavy. Among those who have been removed were: Messrs. P. Stewart, late of Stranraer; John Turnbull, late of Lauder; James Henderson, of Newton-on-Ayr; John F. Irvine, of Kirkcudbright; and John Scott Neil, of Elie. I must not, too, omit to mention the lamented death of Dr. Stevenson Macadam, of Edinburgh, who was closely associated with the gas industry.

The removal list is a large one. Mr. H. M'Nair went from Strathaven to Renton; Mr. W. Stewart, of Ratho, went to Dalbeattie; Mr. Andrew M'Nair, to Strathaven; Mr. C. Winton, from West Calder to Moffat; Mr. John F. Irvine, from Kilmarnock to Kircudbright, where, five months later, he was succeeded by his brother David; Mr. J. Shiell, from Moffat to Berwick; Mr. M. B. Watson, of Stirling, to West Calder; Mr. W. Kellock, of Alloa, to Kilsyth; Mr. John Gibb, from Kirkintilloch to Newton-on-Ayr; Mr. D. Fraser, from Bridge of Earn to Gorebridge; Mr. W. Wilson, of Coatbridge, to Kirkintilloch; and Mr. A. C. Young, of Kelso, is shortly to transfer his services to Arbroath.

The Coatbridge Gas Company are promoting a Provisional Order for the purpose of empowering them to raise £25,000 of additional capital, which is required for extensions at the gas-works, so rapidly is the demand for gas growing. The Company also proposed to ask power to reduce the illuminating power of the gas they supply from 20 to 15 candles; but the Town Council having threatened opposition to the proposal, the Directors of the Company agreed to withdraw it, provided the Corporation did not otherwise oppose the Order. The Town Council met yesterday to consider the matter. They agreed to the arrangement, but decided to petition against the Order formally, so as to keep the matter open, and give them a standing before the tribunal which will hear the parties, and thus enable them to see the arrangement given effect to.

The situation which has arisen at Greenock, where, as will be seen from the report of a meeting of the Town Council which appeared in the "JOURNAL" last week, the Engineer (Mr. W. Ewing) has laid aside the stoking machinery which has been fitted up in the works, and taken to hand labour in the retort house, is a somewhat puzzling one, at first sight. But it is capable of explanation. The place, it appears, is too small to keep two sets of machines going. The capacity of each machine is from 40 to 50 retorts per hour; whereas in Greenock working four-hour charges, there are only retorts equal to from 15 to 20 per hour. It would be wasteful, therefore, to keep two sets of machines going; and Mr. Ewing prefers to employ hand labour. There is also difficulty about storage accommodation. But seeing the good results which Mr. Ewing is getting by means of hand labour, there is no need to discuss the situation; and more particularly so as there is to be a report shortly upon the whole question of the equipment of the gas-works.

The Corporation of Falkirk have had another long discussion upon the question of the railway facilities to be provided for the new gas-works, if they should be put down upon the Thornhill site. The North British Railway Company have prepared plans for a connection; but they do not find favour with the Town Council, because they would require three level crossings over town thoroughfares. The subject goes back to the Committee, so that it can hardly be said that it has been moved forward. It was reported that the present plant being unequal to producing sufficient gas to meet the demand, the Manager (Mr. J. Kincaid) had been instructed to take all steps possible, by the purchase of better coal and the like, to increase the make. The consumption, it was stated, had increased during the past five or six years at the rate of about 10 per cent. per annum.

On Monday, between 4 and 5 o'clock in the afternoon, the gas lights in a portion of the Grahamston district of Falkirk went out. Mr. Kincaid lost no time in finding the cause, which was an accumulation of liquor in a trap. The gas was off for only about an hour.

The Broughty Ferry Town Council have authorized Mr. Forbes Waddell, the Gas Manager, to proceed with the work of erecting a new retort-house, the plans of which he has prepared. The cost will be over £4000.

The subject of the cost of lighting the public lamps at Hamilton came under consideration at the last meeting of the Town Council, on a recommendation by the Gas Committee that the gas should be charged at the ordinary rate. The adoption of the Committee's minutes having been moved by the Convener (Bailie MacHale), Bailie Pollock said he would like to take exception to the recommendation that the lamps be charged for at the ordinary rate. Seeing that they were very large consumers, he considered that there should be a certain allowance made. He found that during the last five years, although the gas remained at the fixed price of 2s. 1d. per 1000 cubic feet, the rate per lamp had gone on steadily increasing. In 1897, the charge was only 16s., while in 1901 it had risen to 18s. 9d. He said he had procured a few figures from Dunfermline, Coatbridge, and Motherwell. In Dunfermline, the gas-works belonged to the Corporation, and the rate was 10 per cent. less for street-lamps than the charge for gas to ordinary consumers. The price of gas was 3s. 6d. per 1000 cubic feet, and the lamps only cost, on an average, about 20s. for lighting and everything. In Coatbridge, the works belonged to a Company; the price to ordinary consumers was 2s. 11d. per 1000 cubic feet; and the lamps cost 23s. 6d., including everything. In Motherwell, the works also belonged to a Company; and the charge was 3s. 4d., less 2½ per cent.—the average cost of each lamp being 20s. per annum. The lighting of the burgh of Hamilton was a considerable tax on the ratepayers. He possibly had extreme views on the subject; but he held that, seeing that the gas-works belonged to themselves, the ratepayers should get off from the charge of gas for the public lamps. He moved accordingly. Bailie MacHale said it was almost impossible for them to come to any conclusion with regard to Bailie Pollock's figures. It all depended upon how long the lamps were kept burning. The practice was to keep a certain number of lamps burning by meter, and to strike an average for the whole. At the same time, he had no objection to take the matter back for further consideration by the Committee. This was agreed to.

An action raised in the Sheriff Court at Inverness by a large number of feuars in Lovat Road, Beaufort Road, and Abertarff Road, in the burgh of Inverness, who craved that the Town Council, as Police Commissioners, should be ordained to light at the public expense those roads, which have not been added to the list of streets in the burgh, has been dismissed by Sheriff-Substitute J. P. Grant, who finds the defenders entitled to expenses. His Lordship sustains the objection to the competency of the action. The Burgh Police Act, he states, enjoins a duty on the defenders to make provision for lighting streets and other places within the burgh; but it is quite clear that, if it is competent for his Court to ordain the Town Council to do this work, it is a corollary that the punishment for disobedience would be imprisonment of the defenders. Only one tribunal—this the Court of Session—had inherent power to compel statutory trustees or commissioners to do a particular duty. Such a power might be expressly

granted to the Sheriff, and had been granted in many cases; but no such power is given under the 99th section of the Act founded on by the pursuers.

Yesterday the inauguration of a new filter took place at the Duns Water-Works. The water being drawn from a hill stream, comes down in a very turbid condition in bad weather. The Directors therefore decided, on the recommendation of their Consulting Engineer (Mr. George Fortune), to instal a Wilson patent automatic self-cleansing filter. The water-works being a considerable distance from the town, it was necessary that the filter should require little or no attention. The Company drove out to the filter-house; and the water, which was of a cloudy appearance from suspended matter, was turned on through a 6-inch pipe. On leaving the filter, it was clear and transparent, closely resembling ordinary spring or natural water. The filter, being started, works automatically, and requires no attention to regulate cocks and valves, or adjustment of inflow or outflow. When the filtering medium becomes partially choked from arrested impurities, the discharge of pure water ceases. The cleansing apparatus then comes into operation, and a limited supply of flushing water discharges the impurities from the filter into another channel. Immediately thereafter, the filtering arrangements re-adjust themselves automatically, and the purification again proceeds, with the inflow of impure water and the outflow of a corresponding amount of clear filtered water. The flushing water required for the removal of the arrested impurities from the filter is about 2½ per cent. of the water filtered. The plant was erected by the Airdrie Iron Company, who have supplied a large number of these filters for manufacturing purposes—in one case in conjunction with their water-softening apparatus. The efficiency of the filter for domestic purposes is best judged by the decrease of cholera and kindred illnesses in tea gardens in India, where the arrangement has been installed. This is the first instance of such a filter being placed upon a domestic supply in this country.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 28.

Sulphate of Ammonia.—Owing to the holidays, the week has been rather an idle one; the business concluded being of only moderate proportions. Values meantime remain unchanged at £10 15s. f.o.b. Hull, £10 16s. 3d. f.o.b. Liverpool, and £10 17s. 6d. f.o.b. Leith. For forward delivery, makers' ideas of price have not been modified; London delivery on Beckton terms being still quoted at £11 2s. 6d. for January-April, and Leith about £11 5s. Buyers, however, do not yet come forward at these prices.

Nitrate of Soda was firm on spot at 9s. 3d. to 9s. 6d., but rather dearer for delivery ahead, in consequence of feared labour troubles at ports of shipment.

LONDON, *Dec.* 28.

Tar Products.—The markets are rather quiet all round; there being an almost entire absence of business owing to the holidays. Pitch is still firm; but there are no transactions to note, although there is a strong inquiry for prompt delivery from London. 90 per cent. benzol is, if anything, a little easier; and consumers do not appear anxious to purchase forward. In 50-90 per cent., there is nothing to report. There are still buyers at 9½d. Creosote is, if anything, rather firmer; there being an improved demand in the North. Crude carbolic is still firm for prompt delivery. Further business has been done in 50's, at 1s. 7½d. Crystals are quiet; and, with the exception of a small demand for 34-35's, there is nothing doing. As regards tar, no contracts have been let in the past week.

The average values obtaining during the week are: Tar, 15s. to 18s. Pitch, east coast, 35s. 6d. to 36s. 6d.; London, 37s. 6d.; west coast, 34s. to 34s. 6d. Benzol, 90's, 10½d. to 11d.; 50's, 9½d. Toluol, 10d. Crude naphtha, 4½d.; solvent naphtha, 11d.; heavy naph ha, 10d. Creosote, North, 1⅛d.; London, 1⅞d. Heavy oils, 2⅛d. to 2¼d. Carbolic acid, 60's, 1s. 11d. Naphthalene, 60s. to 75s.; salts, 30s. to 45s. Anthracene, "A," 2d. to 2¼d.; "B," 1d. to 1¼d.

Sulphate of Ammonia.—There is really nothing whatever doing in this market. The Gaslight and Coke Company are reported to have declined £11 for February-April; but for January there does not appear to be much inquiry. In Hull, the price is still nominally £10 15s. for prompt; but without any business doing. From Leith, no business is reported, although there are some inquiries for January-June. As regards Liverpool, the market is very quiet; and there appears to be a total absence of business.

GAS RESIDUALS IN 1901.

The year has been a disappointing one. The prospects at the close of 1900 were reasonably encouraging; but owing to a number of causes, all recovered products have done indifferently to badly, with the two exceptions of pitch and benzols. Looking at the past twelve months collectively, it appears that the worst periods have been cyclic; in almost all cases April and May having been the months in which lowest prices have ruled. Even in pitch and benzols this has been true; the maximum depression in the former being experienced in April and June. On the other hand, the brighter times have come synchronously. The very worst products have met with a temporary respite in November or December. In one or two instances, the change for the better had set in by October. In the case of carbolic acid, the year has been such a disastrous one that these remarks need a little modification. It was in April that the first sudden decline set in; and unfortunately the end of the year brought nothing better than a check in the downfall. The following is a record of the course of the leading products in detail.

Benzols.—From January to November there was only a fall of 1d. in both grades; 90's opening at 1s. 1d., and 50-90's at 1s. 2d. In April, values ran down to 9d., and in May to 8½d., for both 50-90's and 90's. Before the month ended, 9d. was again current; and June brought another ½d. to the good. In July, 90's topped 50-90's for the first time in the year, and kept the steadier of the two throughout. By the middle of August, 10d. was reached; but this price did not obtain for long, and 9½d. was nearest value all through September and October for 90's. It is true 50-90's kept very close to the higher grade; but in many cases the price was largely nominal, so that 90's really held the top position. November saw a sharp revival to 10½d. and 10d. respectively. In December, 50-90's gave way slightly, but the demand from the gas industry took 90's up to 11½d.; the year closing quietly at 11d., and 9½d. to 10d. for 50-90's.

Pitch.—Save for a spell of low prices in April at 30s. per ton, and in June at 29s. 6d. (east coast), the year was a good one. This period of depression meant a loss of 3s. from January. On the west coast, the fall was only to the extent of 1s. per ton; but prices did not get away from the level of 31s. until the end of October; whereas on the east coast 31s. 6d. was being paid in August, and 32s. for the next two months. November brought a rise to 37s. per ton, and in December 38s. was quoted. On the west coast, there was a sympathetic advance in the same month to 34s. and 34s. 6d.; but there values stopped till the end of the year, the east coast closing price being 37s. 6d.

Carbolic Acid.—This has suffered from a species of paralysis. January started at 2s. 7d. for 60 per cent. crude, and 1d. was lost by March. At the end of May, 2s. 5d. was quoted; but even at this business was slack, so that 2s. 4½d. soon came to be followed by 2s. 3d., in the opening weeks of July. August was a bad month; 2½d. being lost in the four weeks. Thus September came in with a bad outlook, and more than kept the state of bad business up to its traditions; for 1s. 11d. was soon being quoted, and 1s. 10d. later in the month. During November, the price remained at about 1s. 10d.; and with the close of December 1s. 10d. to 1s. 11d. was obtainable. Crystals fared much the same; 40 per cent. falling from 11d. in January to 6¾d. to 7¾d. in December. By the end of February, 9¾d. was current, and 1d. less in June. It took two months to see 7¾d. During September, October, and the greater part of November, 7d. was the general quotation. Liquid carbolic lost 3d. on the year.

Naphthas.—These products have not done well for some time, and in a sense have not fared very ill in such a trying period of depression. Crude opened at 5d., and fell to 4¼d.; while solvent, beginning at 1s. 3d., lost 3d. by the end of May. June saw a brightening again to 1s. 2d.; and 1s. 1d. was good for July to the end of October, when there was a slump to 11d. The year closed flat at this price.

Creosote.—This did very badly in the first half of the year, falling from 1⅜d. to 2¼d. to less than 1d. In the last quarter, however, things picked up a little; and 1¼d. to 2d. was once more obtainable. The year closed with a fairly good outlook, considering, at 1¼d. to 2½d.

We take the following particulars from the annual report, dated Dec. 28, of Messrs. S. W. Royse and Co., of Manchester:—

Sulphate of Ammonia.—Sulphate of ammonia was as high as £11 5s. in January, and as low as £10 in April. It is now about £10 17s. 6d., and the market is only steady. The increased production from blast-furnace gases in this country, on the Continent, and in North America, the position of nitrate of soda, and the depression in the sugar trade, all combine to make buyers very diffident about purchasing, believing that they may gain by waiting. Muriate of ammonia has been selling at steady prices all the year; and demand and supply appear to be well balanced. Carbonate of ammonia has moved along steadily, and during the last few months makers have been very busy.

LANCASHIRE COAL TRADE DURING 1901.

A combination of circumstances—the unusual spell of very severe weather before Christmas, the customary extra requirements for carrying consumers over the holiday stoppages of the pits, but chiefly the general and very great disorganization of mineral traffic over the railways—have brought about a position with the close of the year that, for the time being, has caused an actual scarcity of supplies, and temporarily a strong hardening in prices. Some of the collieries have, in fact, been stiffening in their quotations for contracts into next year; and in many cases consumers under the necessity of obtaining immediate supplies have had to pay special prices to secure them. This, however, is a situation that does not represent the real condition of trade; and when the present pressure is over—or, at any rate, when, early on in the ensuing year, requirements for house-fire consumption begin to slacken—prices would seem more than likely to follow, at least in some degree, the downward course that has characterized the past twelve months.

At the commencement of the year, prices had not given way to any appreciable extent on the high rates that were ruling in 1900. For house-fire coals, in fact, the somewhat "panic" prices of the previous August, when consumers rushed on the market apparently in fear of another coal famine, were still maintained; and the unusually protracted winter enabled coalowners to hold to them till the beginning of May, when reductions ranging from 1s. to 1s. 8d. per ton were officially announced. The long summer brought forward some further concessions on these figures; but the reductions scarcely exceeded 1s. 6d. to 2s. per ton, and pit prices for house-fire coal (which at the commencement of the year were quoted at 17s. to 17s. 6d. per ton for best, 15s. to 15s. 6d. for seconds, and 14s. to 14s. 6d. for common sorts), are with the close firm at 15s. 6d. per ton for best, 13s. 6d. for seconds, and 11s. 6d. to 12s. for common sorts. The chief difficulty between coalowners and consumers has been in the lower qualities of fuel. Common round coals, which at the start were still being quoted at or near the top 1900 prices (averaging 12s. to 12s. 6d. per ton for steam and forge qualities), during the first couple of months, owing to the increasing depression in the iron and steel industries, had to give way about 2s. 6d. per ton. The crucial test of the position, however, came when the large contracts for locomotive fuel and gas coal had to be renewed, and coalowners found that the conditions of the market had widely changed from those that were ruling during the previous year. Then

there was a general industrial boom, which was just at its height; and consumers were more anxious about securing requisite supplies of fuel than about the price they might have to pay. Colliery owners, with practically no stocks on their hands which weak holders might be tempted to push on the market, were in reality the masters of the situation. The ease with which they were able to command advances of 50 to 80 per cent. over the previous year's rates on the important contracts for gas coal and the large railway companies contracts for locomotive fuel, so firmly established their position that consumers of less consequence had no option but to pay the prices that were demanded. The situation during the early part of the present year was, however, altogether different. Large users of fuel, instead of being eager to contract for forward supplies at the prices fixed by the coalowners, were preferring, even at reduced rates, to buy only from hand to mouth; and a number of important local railway contracts for fuel, which in 1900 would have been promptly settled without question, were for months held in abeyance until some sufficiently satisfactory price could be arranged. Not only was there this weakening position as the natural result of lessening requirements, but increasing competition was loosening the bonds of cohesion among coalowners, who last year were able to co-operate so effectually that there was absolutely no cutting in the prices quoted for contracts; recognized "spheres of influence" being marked out for the respective districts, and rigorously observed. In contrast with this, retaliatory measures on the part of one district against another were talked of, especially between Lancashire and Yorkshire, owing to what was regarded as the unnecessary competition of Yorkshire fuel.

As the result of this altered position, there were protracted negotiations before a basis could be reached that represented the maximum concession of the coalowners, and to some extent satisfied the demands of buyers. With regard to the gas-coal contracts, the Lancashire and Yorkshire coalowners eventually arrived at a renewed understanding as to some minimum basis of prices. The associated Lancashire gas-coal collieries held pretty firmly to a maximum reduction of 2s. 6d. to 2s. 9d. per ton on their 1900 rates, for good screened qualities. Outside the associated collieries, however, concessions of 3s. per ton on the previous year's rates were made to secure contracts; while on unscreened qualities there was a general reduction of 3s. 6d. per ton, due largely to the fact that slack was becoming more or less a drug on the market. The general basis on which the gas-coal contracts eventually were settled represented an average of 10s. to 10s. 3d. per ton for good medium screened, such as the Wigan four feet, and from 11s. 3d. to 11s. 6d. for best screened Wigan Arley, as compared with 12s. 6d. to 13s. the average for medium and 14s. to 14s. 6d. for best screened gas coals at the pit, as representing about the general prices obtained the previous year. In renewing contracts for locomotive fuel, however, the Lancashire collieries were not able to take quite so firm a stand; some of the Yorkshire collieries having previously cut down their prices to an extent that was generally regarded as altogether unnecessary. Lancashire coalowners at first were not at all disposed to give way more than 3s. per ton; but eventually they had to sacrifice pretty nearly the whole of the advance they had obtained in 1900, and contracts could only be settled at a reduction of 4s. per ton—representing 9s. as compared with 13s. per ton.

Other descriptions of common round coal had to follow very much on the same lines; and pit prices for steam and forge coals came down to about 8s. 6d. and 9s. per ton at the pit. With the close of the year, there has been some slight stiffening on minimum rates; 9s. to 9s. 6d. per ton representing about the average quotations for good qualities of steam and forge coal, while for extra supplies of locomotive fuel to railways that had contracted only sparingly 9s. 3d. per ton has in some instances been quoted. The position, however, cannot be regarded as at all strong on this basis. The large coal users in the iron and steel trades have scarcely yet received corresponding relief in the cost of fuel as compared with the large reduction in both raw and manufactured material; and when contracts come forward for renewal early in the ensuing year, it is more than probable the question of still further substantial concessions will again be keenly contested.

With regard to slack, which last year reached an altogether unprecedented price for its relative value as compared with round coal, collieries during the past twelve months have for the most part found great difficulty in disposing of their output; and a reduction in prices has taken place which has brought them to more nearly their legitimate level. The increased supplies owing to the large demand for screened house coal during the early months of the year, and the lessened consumption owing to the depression in the chemical, salt, and cotton trades, and other industries that are large users of slack, and a curtailment of requirements for coke making, caused a complete glut of this class of fuel, leading to a fall in prices which, in two months' time, dropped in the open market from 11s. and 11s. 6d. per ton for best, and 10s. 6d. for medium sorts in January, to 9s. 6d. for best and 8s. to 8s. 6d. for medium, although reductions to this extent in list rates were only formally announced in March and April. Large supplies were being pushed on the market from Derbyshire, Yorkshire, and Staffordshire at prices far below those quoted by local collieries, which for the most part were, in consequence, obliged to abandon any attempt at maintaining fixed list rates. Prices were steadily forced downwards, till best Lancashire slack was obtainable at 7s. to 7s. 6d. per ton, and common sorts at 5s. 3d. to 5s. 6d.—a reduction of 4s. to 5s. per ton on the quotations at the commencement of the year—while slack in outside districts was offering as low as 2s. and 2s. 6d. to 4s. and 4s. 6d. per ton at the pit, according to quality. The position towards the close of the year has shown some improvement, particularly in the better qualities, and outside competition is less keen, with the result that prices have hardened up about 6d. per ton for Lancashire slack. This, however, is due largely to special and temporary circumstances; and whether it will be maintained must depend on the position in the textile trades and the chemical and salt manufacturing industries, which are large consumers of slack, and indirectly by the iron trade requirements for coke.

The position in the shipping trade has fluctuated considerably during the year; but for the most part the business doing has been only

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1723.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	18—19	−1	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	6¼—6⅝	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New . . .	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	112—115	..	3 9 7
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	212—217	..	4 12 2
246,320	,,	,,	7	Do. A. Ord. Stk. .	150—155	..	4 10 4
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max. .	118—120	..	4 3 4
420,000	20	Sept. 27	10	British.	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	9¼—9⅜	..	6 3 1
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14⅜—15½	..	6 9 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	265—270	−2	4 8 11
236,425	,,	,,	9	Do. New do. .	203—208	..	4 6 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/10	Gas-light and Coke	4 p.c. Ord. . .	97—99	.. 4 8 10
					3½ p.c. max.	88—90	.. 3 17 9
					4 p.c. Con. Pref.	111—114	−1 3 10 2
					3 p.c. Con. Deb.	90—92	.. 3 5 3
2,600,000	,,	,,	3½	Hongkong & China, Ltd.	13—14	..	5 14 4
2,799,735	,,	,,	4	Imperial Continental .	208—213	..	4 13 11
4,063,425	,,	Dec. 13	3	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
70,000	10	Nov. 13	8	Liverpool United A	232—234	..	4 5 6
3,800,000	Stk.	Nov. 13	10	Do. do. B	170—173	..	4 0 11
473,600	Stk.	Aug. 15	3½	Do. do. Deb. Stk.	119—120	..	3 6 8
561,000	Stk.	Aug. 29	10	Malta & Medn., Ltd. .	4¼—5	..	4 0 0
718,100	,,	,,	7	Met. of 5 p.c. Deb.	105—108	..	4 12 7
306,083	,,	June 28	4	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
75,000	5	Dec. 13	4	Monte Video, Ltd. . .	9—10	..	7 0 0
560,000	100	Oct. 1	5	Newc'tle & G'tesh'd Con.	214—216	..	3 18 8
250,000	100	,,	4½	Do. 3½ p.c. Deb.	100—102	..	3 8 8
541,920	20	Nov. 13	3½	Oriental, Ltd. . . .	7¼—8	..	5 0 0
717,946	Stk.	Aug. 9	8½	Do. New, £4 10s. pd.	6¾—7¼	..	4 19 4
312,855	Stk.	June 28	3½	Do. do. 1879, £1 pd.	1¼—1⅝	..	4 11 5
150,000	5	Nov. 28	8				
135,000	5	,,	8				
15,000	5	,,	8				

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Sept. 27	7	Ottoman, Ltd. . . .	5⅝—5¾	..	5 12 0
851,070	10	Oct. 11	7	River Plate Ord. . .	9⅜—10¼	−¼	6 16 7
250,000	Stk.	June 28	4	Do. 4 p.c. Deb..	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.. . .	11—12	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	241—243	+1	4 2 4
523,498	,,	,,	10	Do. C	241—243	+1	4 2 4
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	123—125	..	4 0 0
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	102—106	..	4 14 4
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton A. 5 p.c.	122—127	..	4 6 8
250,520	,,	,,	4	B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	7⅛—8½	..	5 17 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9½—10½	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12⅞—13½	..	4 8 11
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	107—112	..	3 11 5
				WATER COMPANIES.			
780,599	Stk.	June 28	11¾†	Chelsea, Ord. . . .	320—330	..	3 9 8
150,000	,,	,,	5	Do. 5 p.c. Pret. .	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Oct. 11	7	East London, Ord.. .	200—205	..	3 8 4
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
700,000	50	Dec. 13	8	Grand Junction 10 p.c. max..	113—116	..	3 9 0
310,000	Stk.	Sept. 27	4	4 p.c. Deb..	122—126	..	3 3 6
708,000	Stk.	Aug. 15	14	Kent	300—305	..	4 11 10
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..	298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p.c. max..	218—223	..	3 11 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 15	12 5/10	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Ord. . . .	193—198	..	3 10 8
126,500	100	,,	7	7½ p.c. max.	182—187	..	3 14 10
489,200	Stk.	,,	5	5 p.c. Pref. .	150—155	..	3 4 6
1,019,585	,,	Oct. 11	4	Vauxhall 4 p.c. A Deb.	124—129	..	3 2 0
1,155,066	Stk.	Dec. 13	10	West Middlesex. . . .	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
200,000	,,	Sept 12	3	Do. 3 p.c. Deb. .	96—98	+1½	3 1 3

† Next dividend will be at this rate.

indifferent. Prices have followed much the same course as the inland market; a good deal of surplus output having been forced for sale at the Mersey ports owing to the depression in the common round coal trade. During the year, prices have receded 3s. 6d. to 4s. per ton; the closing rates being about 10s. 6d. to 11s. per ton delivered at the Mersey ports. It may be added that, although the announcement of the export coal duty tended to produce some disorganization of the shipping market, the new tax does not appear to have materially affected the course of trade in this district.

Though during the earlier part of the year the demand for coke fell off owing to the depression in the iron trade, and prices for foundry qualities receded about 4s. per ton, business has since revived, and rates have remained steady; while furnace cokes have very nearly maintained their price all through the year. At the ovens, best Lancashire foundry cokes are quoted 22s. to 24s. per ton, as compared with 26s. to 28s. in January; and best washed furnace cokes have averaged from 13s. 6d. to 14s. 6d. per ton, which were practically about the opening prices.

COAL TRADE REPORTS.

Northern Coal Trade.—The interruption of the holidays has lessened alike the production and the consumption of coal of nearly all kinds. The return to work is partial only, as there will be the further interruption of the New Year. But the closing of factories lessens greatly the use of manufacturing coals, and also the consumption of gas. Attempts will be made in the few last days of the year to ship as much coal as possible to foreign countries, to avoid the tax. Best Northumbrian steam coals are, for prompt shipment, 12s. per ton f.o.b., and steam smalls are from 5s. 9d. to 6s.; but for delivery over the next two months or so, lower prices are quoted for these and for other classes of coals. In Durham coals, the pressure has been great for best gas qualities; and the price for early delivery is 12s. 6d. per ton f.o.b. It is very difficult as yet to state the prices that are likely to be quoted for forward delivery; but for contracts for gas coals over the next few months, the quotation that is generally made is from 9s. 6d. to 10s. per ton f.o.b.—it being supposed that there will be less pressure to export coals, concurrent with the diminished use of gas coals at home as the days lengthen. Coke is steady, and best qualities scarce. Export coke is 18s. 6d. per ton f.o.b, blast-furnace coke is 17s. at Tees-side furnaces, and gas coke is steady at 13s. f.o.b. the Tyne.

Scotch Coal Trade.—There has been more activity, consequent on the rush to get coal through the customs while the rebate lasts. Otherwise the market has been featureless. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 9d. to 11s. 9d., and splint 11s. 3d. to 11s. 6d. The shipments for the week amounted to 196,184 tons—an increase of 21,743 tons upon the previous week, and of 20,986 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,683,276 tons—a decrease of 1,024,513 tons upon the same period of last year.

Gasholder Blown Over at Tideswell.—During a heavy gale which swept over Tideswell (Derbyshire) on Tuesday last, the holder at the gas-works was blown over, and consequently the town was left in darkness. The gasholder (which at the time of the accident was full) had only recently been examined by an expert.

Bilston Gas Company.—In the annual report which will be presented to the shareholders at the meeting of the Company on the 6th prox., the Directors state that the profit and loss account, after paying the usual interim dividend, shows a balance of £3572. From this it is proposed to pay dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares respectively; making, with the interim dividend, 11s. and 8s. for the year. In order to safeguard the interests of the Company, the Directors deemed it necessary (in connection with other gas undertakings in the neighbourhood) to oppose certain clauses in the Mond Gas Bill in its passage through Parliament. The cost of doing this was £629; and the amount has been debited to the revenue account for the year. The high prices paid for coals have further reduced the profits, so that they fall short of the amount required to pay the usual dividends by £791. It is proposed to take this from the unappropriated profits of previous years; thereby reducing the balance to be carried forward to next year's account to £887. Some partial relief from the high price of coal has been obtained, and contracts for the current year have been entered into on somewhat more favourable terms. The sales of gas for the year show a decrease, due to the exceptional mildness of the winter and the depression in trade which prevailed at that time.

Kitson Oil-Lamps for Public Lighting.—We learn from the "Petroleum Review" that an influential deputation of the ratepayers of Paddington recently waited upon the Lighting Committee of the Borough Council to complain of the inadequate lighting of Oxford and Cambridge Terraces, and other places from which the Kitson lamps have been removed. At the interview they submitted the following statement: "The gas-lamps now in use are far too few and too weak to light this broad thoroughfare efficiently; and as the result, in addition to the inconvenience of semi-darkness, it is every night infested by loafers and offensive characters of all kinds, in a way which brings discredit on the neighbourhood and is extremely unpleasant to the residents. As long as the Kitson lights were illuminated, and our streets were, in consequence, sufficiently lighted, we were free from annoyances of this kind; and the work of the police was rendered many times more easy and effective in consequence. Now that these lights have been discontinued, the state of affairs is again as bad as, or worse than ever. There was a practically unanimous opinion of the inhabitants on the efficiency of the Kitson lights. We have particularly noticed how effectual the Kitson lighting has been in the fogs, when all other lights in adjacent streets have failed. Having ascertained the cost of working the system, we consider that, light for light, it will bear comparison with any now in use; and, believing that the comfort and well-being of the ratepayers are the sole care of the Council, we respectfully commend our petition to your favourable consideration."

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Suicides by Inhaling Gas.—Two cases were reported last week of persons invoking the aid of gas for the purpose of taking their lives. A lady who kept a private school at Dover, fearing the loss of her sight, committed suicide in this manner. At Dundee, an iron-turner fixed a tube used in connection with a gas-stove on to the gas-jet, and placed the other end under his vest, bringing it up to his mouth. He then turned on the gas and sat down in an easy chair, where he was found dead by his housekeeper.

Leeds Gas Workers and Sunday Labour.—Meetings of the men employed at the Leeds Gas-Works were held last week for the purpose of considering the scheme drawn up by the General Manager (Mr. R. H. Townsley) for overcoming the Sunday labour difficulty. Under this scheme, one-seventh of the men would be off duty every day, which would mean that each man would get off one Sunday in seven. This would entail the employment of 118 additional men. One point which the men regard as serious is that, in the event of the retorts standing idle on Sundays, a certain number of men would some weeks only work five shifts, which would, of course, mean the loss of a day's pay. The men are desirous of abolishing Sunday work altogether, but do not care for the possibility of a five-day week. They say their object in seeking additional pay for Sunday labour is to minimize as far as possible labour on that day. Again, if the suggested scheme is to come into force, the men think they ought to know beforehand the day that they are to have off. Last Friday the men agreed to adhere to a resolution previously passed, to the effect that they are prepared to accept the 4d. per shift advance, but without any alteration in the working conditions.

Coventry Gas Managership.—The Sub-Committee, to whom was referred, on the 20th ult., the question of the appointment of a Gas Manager to the Coventry Corporation, in succession to Mr. George Winstanley, have reported thereon to the Gas Committee, and have made the following recommendations: That the Manager be required to act as Engineer to the gas undertaking, his duties to include the designing and erection of all new buildings, works, and extensions; that his duties include the engagement and dismissal of all servants and workmen except the permanent staff; that all cheques on the gas accounts be signed by the City Treasurer; that the Manager report to the Committee as instructed; that he give his whole time to the duties of the office; that he be required to live within a distance of the works to be approved by the Committee; that he give security for money passing through his hands to the amount of £1000, by the policy of an approved Guarantee Society, the Corporation paying the premium; that the appointment be made determinable by three months' notice at any time; that the salary be £600 a year; and that the Sub-Committee be authorized to confer with the Auditors as to the forms of periodical returns to be made by the Manager, and to obtain from an expert a report upon the productive capacity of the present works. The subject will come before the City Council to-day, when the Gas Committee will recommend that the foregoing suggestions be adopted, and the matter remitted to them.

New Pipe-Line to Lake Vyrnwy.—The Liverpool Water Committee have decided to recommend the City Council to sanction the laying of a second pipe-line from Vyrnwy to Prescot, at an estimated ultimate cost of £785,000. The section which will be commenced first is that between Norton and Prescot, at an estimated cost of £116,000.

The Control of Gas-Fittings.—At the inquest which was held on the bodies of the two women who were recently suffocated by gas at Middleton, as reported recently (p. 1629), it was stated that the gas had escaped through an old-fashioned bracket of a cheap type. The Jury found that death was accidental, and desired that the Corporation should be recommended to order that such taps should be replaced by modern ones. The Coroner promised to make the recommendation, and said he was surprised to hear that these gas-brackets were common in Middleton.

Assessment of the Aberdare Gas Company.—The Merthyr Union Assessment Committee held a meeting on the 21st inst., at which they considered appeals against assessments under the new valuation. The Aberdare and Aberaman Gas Company were previously assessed at £1777 rateable value; and this had been raised to £1950. Mr. Thomas Newbigging said £1723 would be a fair figure; but Mr. Eve, jun., did not agree with this, and particularly dwelt upon the greatly reduced price of coal as a factor in computing higher profits. The Committee confirmed the valuation.

Quality of Halifax Gas.—Some complaints having been received by the Halifax Chamber of Commerce as to the poor quality of the gas supplied in the town, they have resolved to send a deputation on the subject to the Gas Committee. Mr. J. H. Murgatroyd, in moving that this course be adopted, said this was the third winter that his firm had had an insufficient supply of gas. The last few days the gas had been better than during the whole of this time. Mr. Riley Catchett, who seconded the resolution, said that if the Committee had turned their attention to gas making, instead of to spending money, they might have had a better result.

Padiham Gas Supply.—At the last monthly meeting of the Padiham Urban District Council, the Gas Urgency Committee presented a report dealing with the condition of the gas-works. They stated that a number of retorts erected under the supervision of the late Manage had given way, owing, as the Committee were advised, to the faulty manner in which the brickwork had been laid. This state of affairs had caused the Committee some anxiety; but they were of opinion that, unless there was another mishap, they would be able to carry on the works during the remainder of the present lighting season. Mr. Riding moved that the report be referred back, on the ground that it was not a fair one. Mr. Roberts said if the report was referred back it would be worse instead of better. Mr. Monk did not think any reflections were cast on the former Gas Manager. The report was issued to protect the present management. Mr. Holland was of opinion that if there were any charges against the late Manager, the Council should have them, and finish the matter. Eventually the amendment to refer the report back was carried by two votes.

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Reductions in Price.—It is announced that the price of gas at Gravesend is to be reduced to 3s. 2d. per 1000 cubic feet. The Hinckley Urban District Council have resolved to reduce the price 2d. per 1000 cubic feet, to 3s. 4d. and 2s. 10d.

The Sequel to the Taff Vale Strike.—The statement of claim in the action instituted by the Taff Vale Railway Company against the Amalgamated Society of Railway Servants and others, for damages sustained by the alleged action of the defendants at the time of the recent strike (*ante*, p. 1687), has been served upon the Solicitors for the Society. The plaintiffs claim £24,626, their estimate of the damage suffered by the alleged conspiracy and unlawful combination of the defendants.

The Illuminating Power of the South Metropolitan Company's Gas.—At the meeting of the London County Council last Tuesday week, the Chairman of the Public Control Committee (Mr. W. C. Johnson) stated, in answer to Mr. Organ, that the South Metropolitan Gas Company had obtained authority to reduce the illuminating power of their gas from 16 to 14 candles, on condition that they supplied and fixed free to consumers burners suitable for gas of the lower power. Though the Company had given notice that they would supply such burners to any consumer who asked them to do so, he understood that many had not applied. It was important that the public should know that the old burners were not suitable for the gas now supplied by the Company, and that consumers would save money and obtain better light by securing the new ones offered. Some of the burners which had been issued by the Company were governor burners, and were very satisfactory; but others were not so suitable when the gas was burnt at a high pressure. Consumers should therefore ask for governor burners in every case.

Entertainment at the Dover Gas-Works.—The reading and recreation room at the Dover Gas-Works was established in 1887; and it has proved a perfect boon to the men. Not one of the least enjoyable of its uses is the annual entertainment which is arranged to celebrate the opening fourteen years ago; the event always being looked forward to not only for the amusement it gives, but for the opportunity it affords for a reunion in a social way of all connected with the Company. The 12th inst. witnessed the annual celebration, on which occasion the President of the room (Mr. R. Herring) was in the chair. Mr. W. Mannering, the Chairman of the Company, and Mr. T. W. Fry, the Vice-Chairman, with other Directors, attended, and took part in the proceedings. The entertainment provided was by no means behind its predecessors in point of excellence; the programme being carried out by the Dover Minstrels. During the evening Mr. Herring reviewed the year's work; and later a presentation was made to the Secretary of the room, Mr. H. Harman—the gift taking the form of a framed portrait of himself. Mr. Harman, who has occupied the position named since the room was established, pledged himself to do his utmost for its advancement. Speeches by Mr. Mannering and Mr. Fry followed; and the National Anthem concluded an evening which was heartily enjoyed by all present.

Fire at the Witney Gas-Works.—A fire broke out about midnight of Thursday at the gas-works at Witney, Oxfordshire. It was well alight before the firemen arrived; but the brigade were nevertheless able to prevent the flames spreading to the retorts. The works are in the centre of the town; and the fire caused considerable alarm. The damage done was not great.

The Pence-Absorbing Slot Meter.—If slot machines continue to extend, there will certainly have to be an increased issue of bronze coinage. Slot gas-meters are daily growing in number throughout the country; and in almost every main thoroughfare and at every railway station mutoscopes, strength-testing machines, and automatic suppliers of dainties and luxuries invite the passer-by to deposit pence in their capacious receptacles. These naturally absorb, and keep from circulation, at all times a large amount of bronze coin; and the changed circumstances, it seems, will have to be brought to the notice of the authorities responsible for the issue of the realm's coinage. The growing requirements of the public for pence must be met; and, if the story which comes from Leeds is true, the cash business of the country will suffer if a shortage of pence is permitted. The item of news which has been circulated from the city named is as follows: "Penny-in the-slot gas-meters have been the cause of quite a curious dilemma among the Leeds tradesmen this Christmas; there being a distinct dearth of pence in the town. Leeds has now 16,652 penny-in-the-slot meters—an increase of 1483 since June; and nearly £18,000 is annually collected by the inspectors, who empty the cash-boxes six times a year. These receptacles are credited with having devoured all the available supply of coppers."

Hastings Public Lighting.—At the last fortnightly meeting of the Hastings Town Council, it was decided, on the recommendation of the Public Lighting Committee, to purchase the whole of the existing columns, brackets, lamps, and burners (1410 in number) belonging to the Gas Company. In the course of negotiations between a Sub-Committee and the Company's Engineer (Mr. C. E. Botley), an offer of the above-named plant for £4500 was sent by the Directors; but the Sub-Committee made a counter offer of £3000. Without admitting that this represented anything like the real value of the plant, the Directors decided to accept the lower sum, with the view of putting the question of the public lighting of the town on a more satisfactory basis. The purchase is expected to result in a saving of £150 per annum. At the same meeting, it was also resolved, on the recommendation of the Committee, that the whole of the existing "Whitehall" and treble-burner lamps be converted into 100 candle incandescent gas-lamps, and that the existing ordinary "Coleman Street" lamps (two burners) be converted into ordinary 50-candle incandescent lamps. It appears that certain of these classes of lamps have been converted as proposed, by way of experiment, with highly satisfactory results. The total number of lamps proposed to be converted is about 26; and the cost of providing the new burners and making the lamps windproof, &c., will be about £1 2s. 6d. per lamp—a very moderate outlay indeed.

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SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

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Gas Poisoning Cases in Scotland.—On the morning of Sunday, the 15th inst., fifteen persons, in four houses in Johnston Terrace, Carron Road, Falkirk, were found to have been poisoned by gas which had escaped from a main-pipe in the roadway. They all recovered. On Wednesday last, a man named David Logan was found lying unconscious in the lobby of his house at No. 106, George Street, Mile End, Glasgow. He was taken to the infirmary, and recovered. There was an escape of gas from a broken pipe in front of the house.

Explosion of Gas in Kilmarnock.—On Thursday evening last, an explosion of gas took place in the shop of ex-Bailie R. M. Killie, in Waterloo Street, Kilmarnock. A plumber had been sent for in consequence of an escape of gas which there was difficulty in tracing. He approached the meter with a light, and the explosion occurred. The man and a shop assistant got a severe shock, but were otherwise unhurt. Two plate-glass windows were blown out, a counter was shifted about 2 feet, and the flooring was considerably damaged.

Explosion of Mond Gas.—Last Saturday morning a serious accident happened at Messrs. Albright and Wilson's Phosphorus Works at Oldbury, which caused considerable alarm among the workpeople. It appears that four workmen were engaged cleaning out an underground flue in connection with the Mond gas plant, when a lamp was upset, and the gas which had accumulated in the flue exploded. The men were got out as quickly as possible; and it was found that all of them were burnt, two rather seriously. They were also partially suffocated. They were promptly taken to the West Bromwich District Hospital, where two were detained. The others had their injuries dressed, and were removed to their homes.

Smethwick Gas Supply.—At the last monthly meeting of the Smethwick Town Council, the Gas Committee reported that the quantity of gas sent out in the four weeks ending Nov. 14 was 2,542,000 cubic feet more than in the corresponding period of last year. The Chairman of the Committee (Mr. J. Stones) directed attention to the increased quantity of gas delivered, and said that every retort and every machine was being worked in order to meet the demand. He added that one of the largest firms who had intended to introduce the electric light had now decided to continue the use of gas; so that he thought the gas undertaking had a good future. The General Purposes Committee, in their report, recommended that the Gas Commit ee be requested to undertake the illumination of the public buildings in the borough on the occasion of the Coronation. Mr. Stones remarked that his Committee had previously had two similar orders, and what they wanted now was a specification and a price. The other orders were executed; but they never had anything for them. The Committee had fully discussed the matter, and they considered that if they contributed £2000 a year to the district rate this was all they were justified in doing. Anything beyond this should, they thought, go towards reducing the price of gas for manufacturing and other purposes. As they all knew, the large manufacturers were being driven out of Birmingham; and if Smethwick only kept down the rates and reduced the price of gas, they would get them there. Eventually both reports were adopted.

The Keystone Incandescent Company, Limited, has been registered with a capital of £10,000, in £1 shares, to manufacture and deal in incandescent, electric, gas, and other appliances, &c.

After a business connection extending over some 25 years, Mr. James Brady relinquishes to-day the country sales agency for the Eckington coals of Messrs. J. & G. Wells, Limited. On and from to-morrow, therefore, all communications on the business of the firm should be addressed direct to them. As Mr. Brady is known to a large number of our readers, he asks us to notify that his address will still be the Yorkshire and Midland Colliery Offices, No. 52, Earl Marshal Road, Pitsmoor, Sheffield.

The proprietors of "The Ironmonger" are offering prizes for competition in connection with illumination devices for the forthcoming Coronation ceremonies. Among them are a prize of a guinea and two prizes of half a guinea each for articles containing the most practical suggestions for devices; and they will be awarded to the competitors whose schemes combine originality and effectiveness with moderate outlay. The competitions are open to subscribers, members of their families, and their assistants.

The "Financial News" states that the Glasgow Corporation have been requested by the Welsbach Incandescent Gaslight Company to discontinue using mantles on street-lamps, which the Company claim infringe their patent. They further state that they have obtained interdicts against infringers in Scotland from the Court of Session. The Corporation Lighting Department, after consulting the Company's Solicitors, refuse to discontinue the mantles, but promise not to add to their stock until the matter has been settled in a competent Court.

At a recent meeting of the Hastings Natural History Society, Mr. C. F. Botley, Assistant-Engineer of the Hastings and St. Leonards Gas Company, gave an interesting lecture on "The Practical Side of Electricity." In the course thereof, he dealt with the question of lighting by arc and incandescent lamps. He took his audience from the manufacture of the platinum wire to the means adopted of making a vacuum in the bulbs. The direct and alternating current systems of lighting were mentioned, and the lecturer also alluded to electric traction. The overhead and other systems of generating motor force were explained very interestingly; and a few words on electrical machinery brought to a close an exceedingly pleasant evening.

A Syndicate of capitalists, under the style of the Barrow-in-Furness Coal Exploration Company, Limited, some time ago began boring for coal at Risedale, Barrow in-Furness. A depth of 2000 feet was pierced, and the red sandstone formation has not yet been passed through, and the capital subscribed by the Company is exhausted. The cost of the boring has been about £2 per foot. It is not proposed to give up the work of exploration; and the "Engineer" learns that a circular has been sent round to the leading capitalists of the district with the view of raising new capital to get down to a depth of at least 3000 feet to determine what underlies the sandstone formation. In the St. Bees district, coal is found beneath these measures; and it is hoped to discover the same conditions in Furness.

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Public meetings have been held at Rushden and Higham Ferrers in connection with the proposed promotion by the Local Authorities of a Bill in Parliament for the constitution of a Joint Water Board between the Higham Town Council and the Rushden Urban District Council, and for the construction of new works. In both cases the scheme was approved.

By an announcement which appears elsewhere, our readers will see that an opportunity is presented for securing an interest in the New River Company; the Directors having decided to issue £200,000 of 3 per cent. debenture stock ("D"), being the second portion of the £1,000,000 of this stock authorized by the Company's Act of 1897. It will be redeemable at par at any time after the expiration of 25 years from the date of issue. Tenders must be delivered before 10 a.m. on Jan. 9.

In the abstract of the accounts of the Borough of Plymouth for the year ending on March 31 last, it is stated that the water-works showed a gross profit of £14,116, and after paying dividend, interest, and repayment charges, a net profit of £2283. The expenditure on capital account (extension and renewal of mains, &c.) was brought up from £81,191 to £85,503. The electricity undertaking exhibited a gross profit of £1151 (charging current for the trams at 3½d. per unit and for private lights at 4½d.); but dividend, interest, and sinking fund charges converted this into a loss of £1906—making an accumulated deficiency of £3173.

In a paragraph in the "JOURNAL" recently (p. 1629), we gave some comparative figures showing the burden of local rating in various English boroughs. The particulars were compiled as stated, by Mr. G. Swainson, the Borough Treasurer of Bolton, who, we now learn, obtained his data from the statement (prepared by Mr. James Carter, the Borough Treasurer of Preston), which was noticed in our columns on the 10th inst. Mr. Swainson added the figures for Bolton, the rateable value of which is £775,809; while the total rates amount to 5s. 2d. in the pound.

In connection with the opening of new gas-works at Freshwater, Isle of Wight, on Nov. 25, a week's exhibition of gas-cookers, fires, and other apparatus, was held in the Assembly Rooms by the Richmond Gas Stove and Meter Company, Limited. An extensive display of modern fittings, furnished with the Welsbach light, was also made; the hall being very brilliantly illuminated. Large audiences attended the cookery lectures, which were given afternoon and evening by Miss Mary Laverock. During the week, orders for about 150 cookers were obtained. The firm have entered into a contract with the Gas Company for the sole supply and fixing of the various gas appliances which will be required in the district supplied by them (covering the whole of Freshwater, Totland, and Alum Bay), and also for fixing slot installations. Extensive and commodious showrooms have been opened in one of the main thoroughfares, in which a brilliant display of all the latest appliances is shown. The Directors of the new Gas Company, we are informed, are gratified at the numerous inquiries and applications, which have been made (through the influence of the contractors' canvassers) in the short time that has elapsed since the opening of the works.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PROVINCIAL Gas Companies may profitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.
Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

OXIDE OF IRON OF FINEST QUALITY.
BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
BALE & CO., 122, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDIZE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

THE METROPOLITAN GAS METERS, LTD.,
While wishing all their Friends in the Gas World
A HAPPY AND PROSPEROUS NEW YEAR,
take the opportunity of THANKING the many Managers, Engineers, and Secretaries of the Gas Companies of the United Kingdom FOR THEIR ESTEEMED PATRONAGE during 1901, and hope for a CONTINUANCE OF SAME DURING 1902.
Offices: 62, Glengall Road, Old Kent Road, S.E. 30/12/01.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS,
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS-TESTING.

MR. T. E. PYE (Eleven Years' Experience in Gas-Works Laboratories) is prepared to visit Gas-Works, and to REPORT to Management on Sulphur Impurities, Illuminating Power, &c., or as to general workings. Tests of Ammoniacal Liquor, Spent Oxide, &c.

No. 372, STANSTEAD ROAD, LEWISHAM.

Drawings Prepared for Works Extensions. Tracings Made.

CHEMIST (M.A. Cambridge, Royal College of Science, and Institute of Chemistry), at present engaged in directing a large teaching Laboratory, seeks appointment as a PRACTICAL CHEMIST in one of the Chemical Industries. Is an experienced Analyst. Disengaged in a few months.

Address "CHEMIST," care of G. W. Byrne, Esq., Solicitor, 14, Bell Yard, TEMPLE BAR, W.C.

ACCOUNTANT Clerk (Age 29) at present engaged with an important Provincial Gas Company, seeks an appointment in March next, or earlier if desired. Private Accounts, Rentals, and other Departments, including successful system of Coin Meters, Fittings, Show-Room, &c.

Address W. M. ILIFF, Gas Offices, CHELTENHAM. First-class References, including the General Manager, R. O. Paterson, Esq., C.E.

CHANDELIERS AND GAS-FITTINGS.

IMPORTANT wholesale House in Amsterdam wants the REPRESENTATION or EXCLUSIVE SALE for CHANDELIERS and GAS-FITTINGS for the Dutch Market of a competing Manufacturing Firm. First-class References.

Please address, with Catalogues "I.T.S.," care of Nygh & Van Ditmar's General Advertising Offices, AMSTERDAM.

Prices also wanted for Rope and Plain Harps by large quantities.

WANTED, by a Suburban Gas Company, an INSPECTOR of good address, capable of advising Customers with reference to the fixing of Fittings, Gas Cooking and Heating Stoves, &c. He will also be required to test Meters, and to superintend the Installation of Fittings on the Prepayment Slot Meter System. To a thoroughly competent Man, good Wages will be paid.

Apply, by letter, stating Age, Qualifications, and Wages required, to No. 3796, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENERAL FOREMAN.

WANTED, a thoroughly competent Man to act as GENERAL FOREMAN of a large new Gas-Works in Scotland.

He must be a thoroughly competent Man in the modern methods of Gas Manufacture, and have had experience with Mechanical Appliances and Inclined Retorts.

A strict disciplinarian, a good organizer of labour, and one having had similar experience in a large Works elsewhere.

Wages from £3 to £3 10s. per week with six-roomed Cottage, Fuel and Light, &c.

Apply, in the first instance, stating Age, Experience, and enclosing *copies* of Testimonials, to No. 3795, **care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

SOUTH SHIELDS GAS COMPANY.

SUPERINTENDENT.

THE Directors invite Applications for the post of SUPERINTENDENT at their Jarrow Gas-Works.

Applicants must be good Carbonizers, and should have practical experience in Sulphate of Ammonia Manufacture.

Salary £170 per annum, with House on the Works.

Statement of Duties may be obtained from Mr. T. H. Duxbury, Engineer, Gas Company, South Shields, to whom applications, endorsed "Superintendent," must be delivered not later than Ten a.m., on Thursday, Jan. 9, 1902.

J. H. PENNEY,
Secretary.

Gas Offices: Chapter Row,
South Shields, Dec. 27, 1901.

24 Tinmen Wanted immediately (Case Makers and Finishers).

Apply to the METROPOLITAN GAS-METERS, LTD., Works, Willowbrook Road, Trafalgar Road, OLD KENT ROAD, S.E.

SHARES Wanted in C. & W. Walker, either Preference or Ordinary.

State Number for disposal and Price required to No. 3791, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE — Crossley 1-Horse Power GAS-ENGINE complete, with Water Vessel, &c. Apply to JAMES COWNEY, Gas Company, SEAFORD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—

GASHOLDER (and Cast-Iron Tank), 17,500 cubic feet capacity.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

COUNTY BOROUGH OF BURY.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Gas Committee are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of Tender may be obtained from Mr. H. Simmonds, Engineer and Manager, Gas-Works, Elton, Bury.

Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent to the undersigned not later than Saturday, Jan. 14, 1902.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, Dec. 24, 1901.

BOROUGH OF NELSON.

THE Gas Committee are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS.

Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.

Tenders, endorsed "Fire Clay Goods," and addressed to the undersigned, must be received not later than Jan. 20, 1902.

The Committee do not bind themselves to accept the lowest or any Tender.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson,
Dec. 16, 1901

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 80,000 Tons of best GAS COAL from the beginning of April, 1902, until the end of December, 1902.

The Magistracy reserve the right to divide the Contracts between two or more Contractors.

Further Information and Conditions for the delivery may be obtained on application to Kjöbenhavns-Belysningsvæsen, Vestre-Boulevard, Köbenhavn B.

The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Det nye Baadhus, Köbenhavn B, before the 6th of January, 1902, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.

THE MAGISTRACY OF COPENHAGEN.

Dec. 14, 1901.

JOHANNESBURG MUNICIPALITY.

MUNICIPAL NOTICE No. 97.

CARBURETTED WATER GAS PLANT.

TENDERS are invited for the supply and delivery of a complete CARBURETTED WATER GAS PLANT of a capacity of about 200,000 cubic feet daily.

Specification with general Plan of present works, can be obtained on application, from the Crown Agents for the Colonies, Downing Street, London, or from the Town Clerk, Johannesburg.

Tenders in sealed envelopes, marked on the outside "Tender for Carburetted Water Gas Plant," to be received by the Town Clerk, Johannesburg, on or before Jan. 31, 1902.

The lowest or any Tender not necessarily accepted.

LIONEL CURTIS,
Acting Town Clerk.

Johannesburg, Nov. 4, 1901.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 7th day of January next, and WILL BE RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on the 7th day of February next.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Dec. 27, 1901.

WATFORD GAS AND COKE COMPANY.

PURIFYING LIME.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply of 180 Tons (more or less) of PURIFYING LIME, to be delivered, as required by the Company, free on rail at the Bushey Station, L. & N.W. Rly., in quantities of not less than 6 Tons, between the 1st of January, 1902, and the 31st of December, 1902.

All Core to be allowed for, and Analysis of Lime to be enclosed with Tender.

Tenders, endorsed "Lime," and addressed to the Chairman, Watford Gas and Coke Company, must be delivered at the Offices of the Company, not later than Wednesday, the 8th of January, 1902.

The Directors do not bind themselves to accept the lowest or any Tender.

J. DUNCAN ROYAL,
Secretary.

Gas-Works, Watford,
Dec. 28, 1901.

NEW RIVER COMPANY.

ISSUE OF £200,000 THREE PER CENT. DEBENTURE STOCK "D."

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue (being the second portion of the £1,000,000 DEBENTURE STOCK "D" authorized by the New River Company's Act, 1897), bearing Interest at Three per Cent. per Annum, and redeemable at par at any time after the expiration of 25 years from the date of issue, upon Six Months' previous notice being given by the Company. The Stock will be issued subject to a Reserved Price.

Tenders must be delivered at the Company's Office, Rosebery Avenue, Clerkenwell, E.C., not later than Ten a.m., on Thursday, the 9th of January, 1902.

Particulars and Conditions, together with Forms of Tender and the Sections of the Act of 1897 authorizing the Debenture Stock, may be obtained at the said Office, or will be forwarded on application.

This Stock is a lawful Investment for Trustees.

By order of the New River Company,
JAMES SEARLE,
Clerk.

New River Office: Rosebery Avenue,
Clerkenwell, E.C., December, 1901.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £62,035 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £90 per Cent.

NOTICE is Hereby Given that, it is the intention of the Directors of this Company to sell by TENDER £62,035 THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Acts, 1882 and 1896.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Tuesday, the 14th day of January, 1902.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower Price than at the rate of £90 money for each £100 Debenture Stock.

By order,
FRANK BUSH,
Secretary.

Offices: 709, Old Kent Road,
London, S.E., Dec. 14, 1901.

CRYSTAL PALACE DISTRICT GAS COMPANY.

SALE BY TENDER OF £15,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £140 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER

£15,000 OF FIVE PER CENT. PERPETUAL DEBENTURE STOCK

in accordance with the Provisions of the Crystal Palace District Gas Act, 1893 (56 and 57 Vic.).

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Thursday, the 16th day of January, 1902.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than at the rate of £140 money for each £100 Debenture Stock.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works,
Lower Sydenham, S.E.,
Jan. 1, 1902.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO BE SOLD by Auction, in the Board Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 21st of January, 1902, at Half-past Twelve o'clock precisely, by

MR. CHARLES A. JOEL,

in such Lots as are provided for in the Company's Act of 1894—

FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894.)

(or thereabouts), being such amount as will make up, with the Premiums thereon, the balance of Preference Stock authorized to be issued under such Act.

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne,
Dec. 17, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £10,000 ADDITIONAL "B" CONSOLIDATED STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, 1902, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALDERSHOT GAS AND WATER COMPANY.

£5192 15s. FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, Jan. 14, 1902, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

Just Published, Price 1s. Post Free.

A MEMORANDUM
ON THE
MOND GAS SCHEME
By F. N. KEEN,
Of the Middle Temple, Barrister-at-Law.

The Pamphlet contains a Summary of the Principal Provisions of the South Staffordshire Mond Gas (Power and Heating) Company's Act, 1901, and of some of the matters raised in evidence before the Parliamentary Committees that dealt with the Bill.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

TO WISH
OLD FRIENDS AND NEW
THE GOOD OLD GREETING:

A Merry Christmas and a Happy New Year.

WELDON MUD
FOR
GAS PURIFICATION,

For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

GAS COMPANIES' BOOK-KEEPING.

A PRACTICAL TREATISE ON THE KEEPING OF GAS COMPANIES' ACCOUNTS.

By **JOHN HENRY BREARLEY,** of Longwood, and **BENJAMIN TAYLOR,** of Cleethorpes.

The only complete Treatise on Gas Companies' Book-Keeping ever published.

This book will be found invaluable to those desirous of obtaining a thorough grasp of Gas Companies' Book-Keeping and Accountancy.

A complete set of Transactions are dealt with; the same being entered into the various Books, and posted into the Ledgers. A Model Balance-Sheet is prepared from the set of transactions and postings.

Forms and subsidiary books are illustrated and described. The linking together of the various books is shown at a glance by means of a Chart.

OPINIONS OF THE PRESS.

The Accountant.—"No pains have been spared by the authors to make this book complete in every respect. The system of accounts recommended is not only a model of clearness, but also fully adequate to meet all reasonable requirements. Generally the get-up of the book, and of the various forms and specimen rulings shown therein, is excellent. The work will be found both useful and reliable, while its convenience is greatly enhanced by the inclusion of an adequate index."

Gas Engineer's Magazine.—"It is difficult to speak too highly of the clearness in which the authors have set down every detail. The 'Model set of Books' appear to us to be about as complete as experience and careful thought can make them. The authors have placed within the reach of every official of a Gas Undertaking, a book that we venture to prophesy will become a standard work, and will prove the guide, philosopher, and friend of all those who are engaged in the keeping of gas-works accounts."

Leeds Mercury.—"The explanatory remarks are given in language that cannot be misunderstood."

NET PRICE: CLOTH BOUND, 12s. 6d.; MOROCCO GILT, 18s.

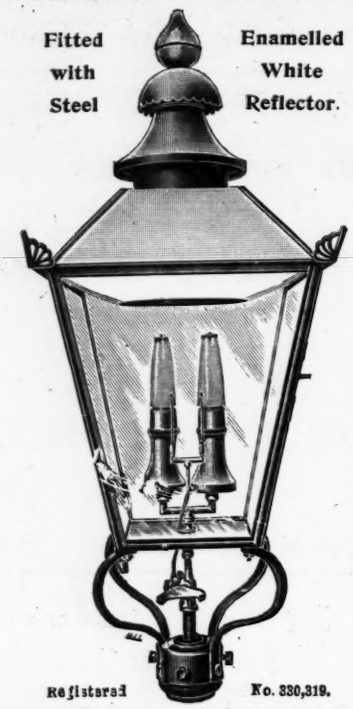
LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

THE

"KILBURN" LANTERN.

Fitted with Steel Reflector.

Enamelled White Reflector.



Registered No. 330,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, LTD.
Late of Cannon Street,
Works and Show Rooms:
19, Farringdon Road, E.C.
Registered Offices:
36, Mark Lane, E.C.
Telephone: 2669 AVENUE. Telegrams: "LUMINOSITY."

NITRATE of Thorium and Cerium, FABRIK CHEMISCHER PRAPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.
Prices are Reduced.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE, SON & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE,
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING
GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Dec. 3, p. 1489.]

CORONATION

PRICE LIST NOW IN PREPARATION
OF DEVICES FOR
GAS ILLUMINATIONS
IN
New & Artistic Variety.

JAMES MILNE & SON, LTD.,
EDINBURGH. LONDON. GLASGOW. LEEDS.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS SHEFFIELD."

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.

165, QUEEN VICTORIA STREET, E.C.;

And at STROUD, GLOUCESTERSHIRE.

HARDMAN & HOLDEN, Ld.

ESTABLISHED 1820.

SULPHURIC ACID.

MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.

Inquiries Solicited.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

GAS ENGINEERS' AGENTS AND CONTRACTORS FOR Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

80, CANNON STREET, E.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

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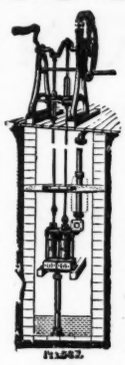

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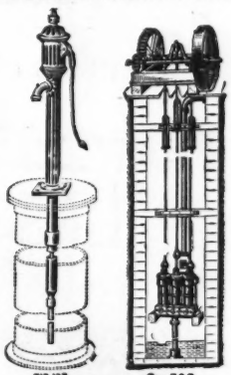

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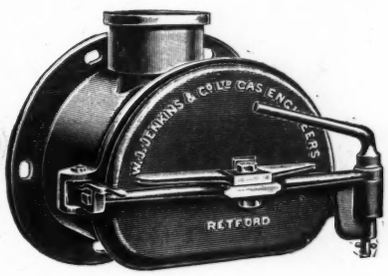

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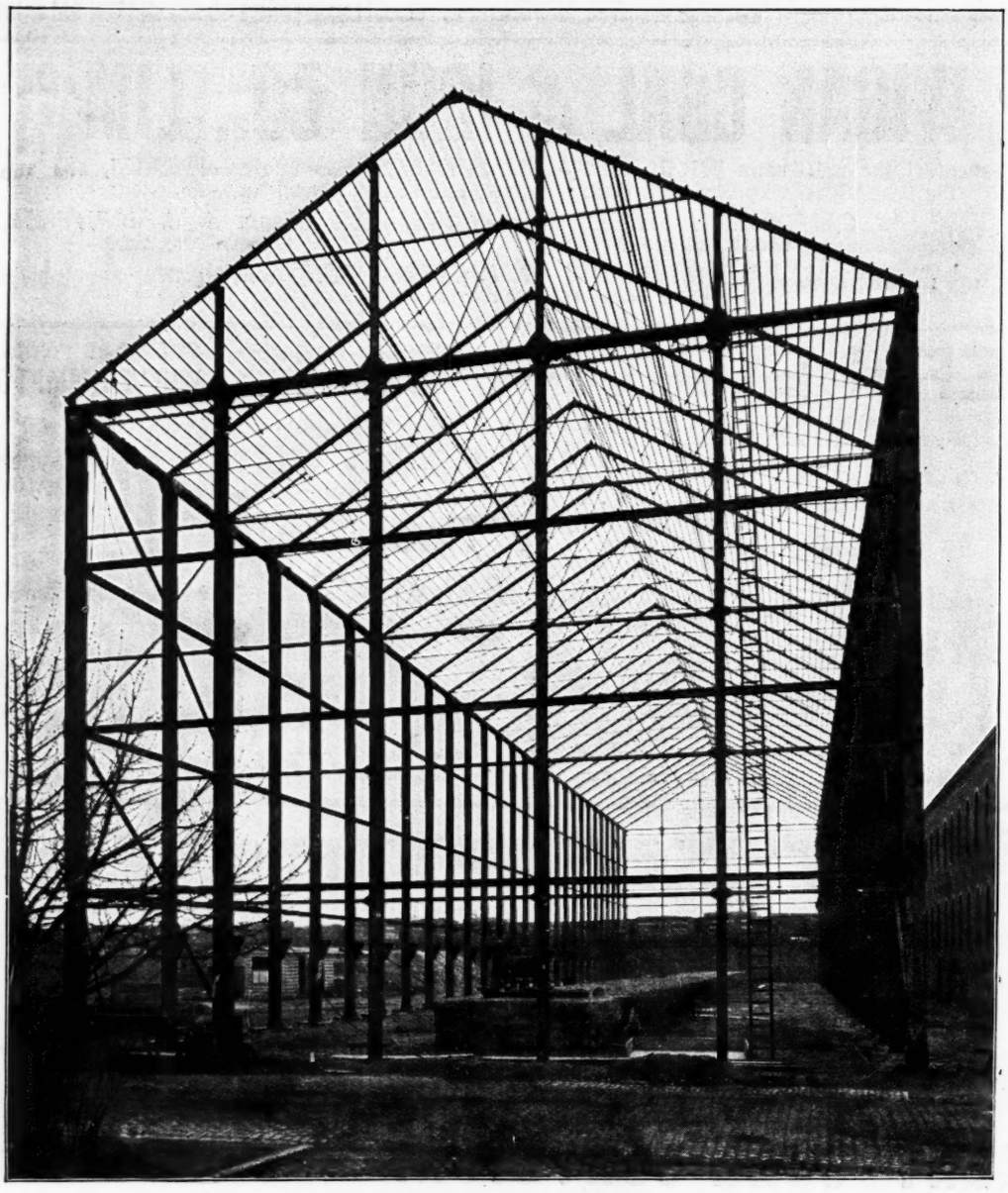

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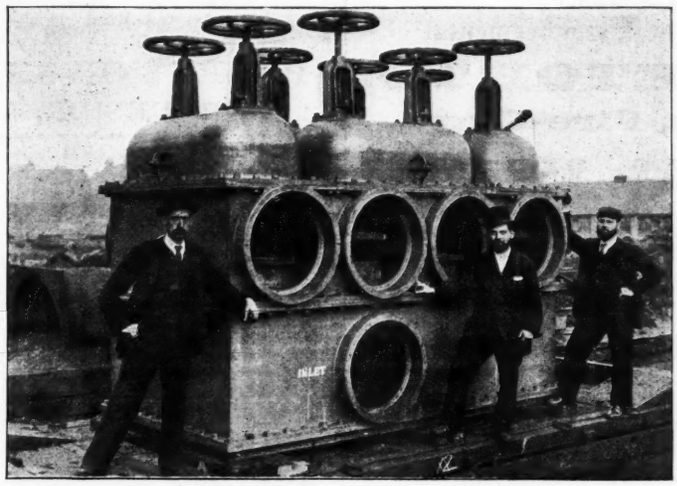

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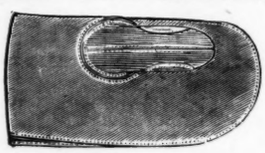

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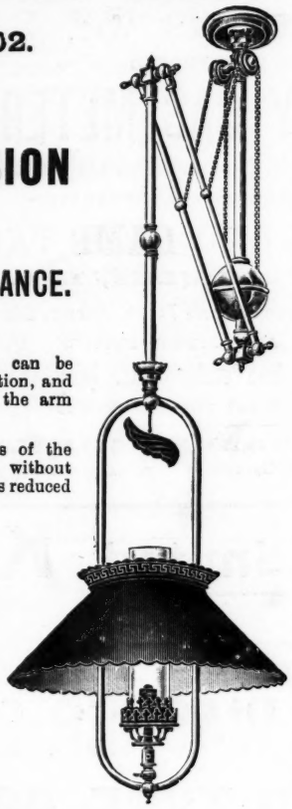

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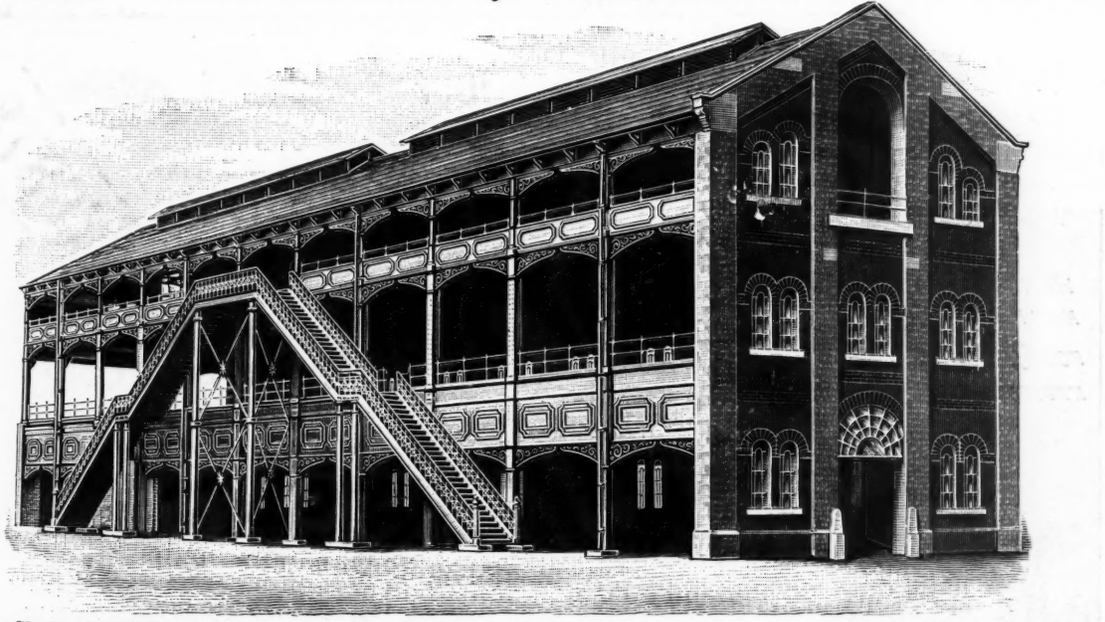

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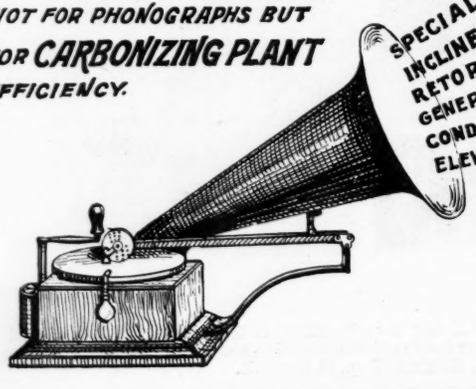

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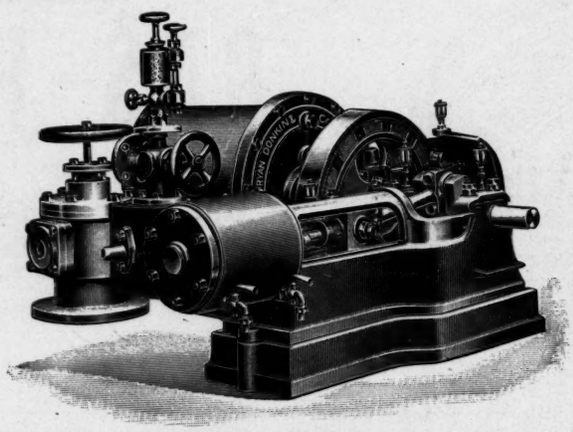

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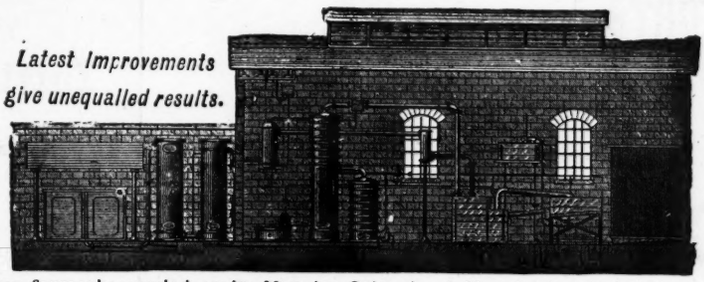

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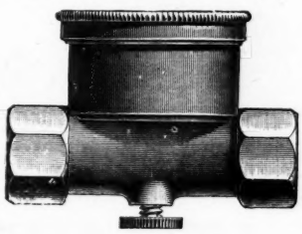

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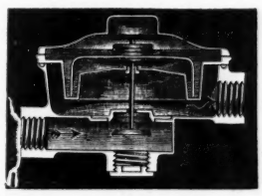

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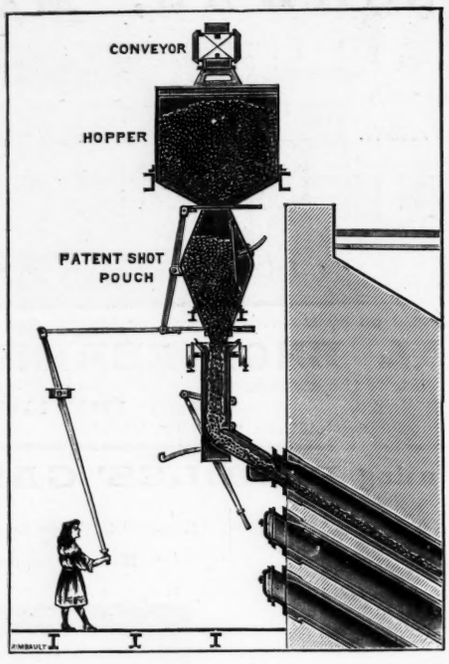

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INSTRUCTIONS.

The Brass Plate has holes around its edge, numbered; these indicate the feet delivered for the Coin used.
To set the Meter, note Figs. I., II., III., IV.

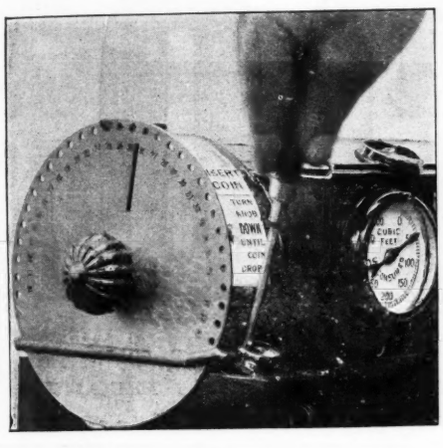

Fig. I.
Break Company's Seal and Remove Screw—THUS.

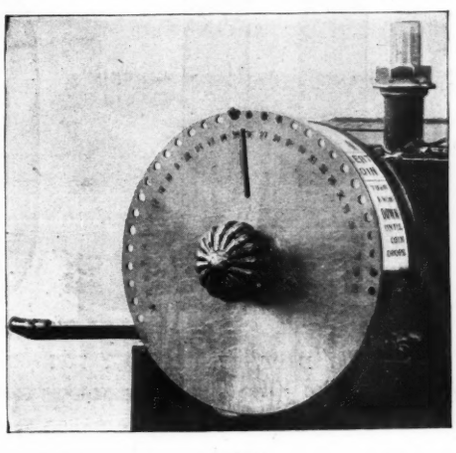

Fig. II.
Swing Band Back—THUS.

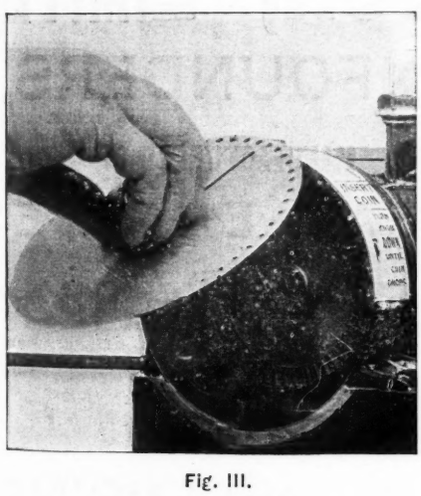

Fig. III.
Lift Plate Off—THUS.

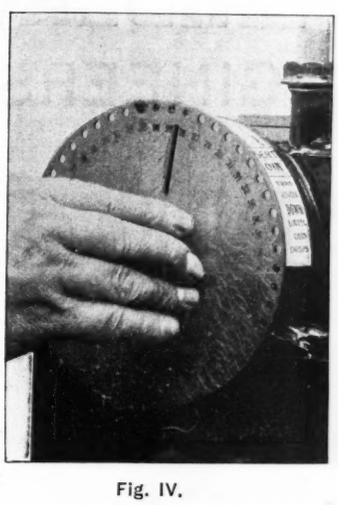

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re seal.

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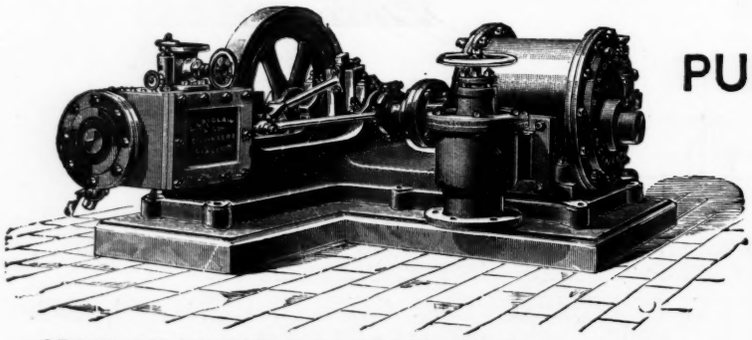

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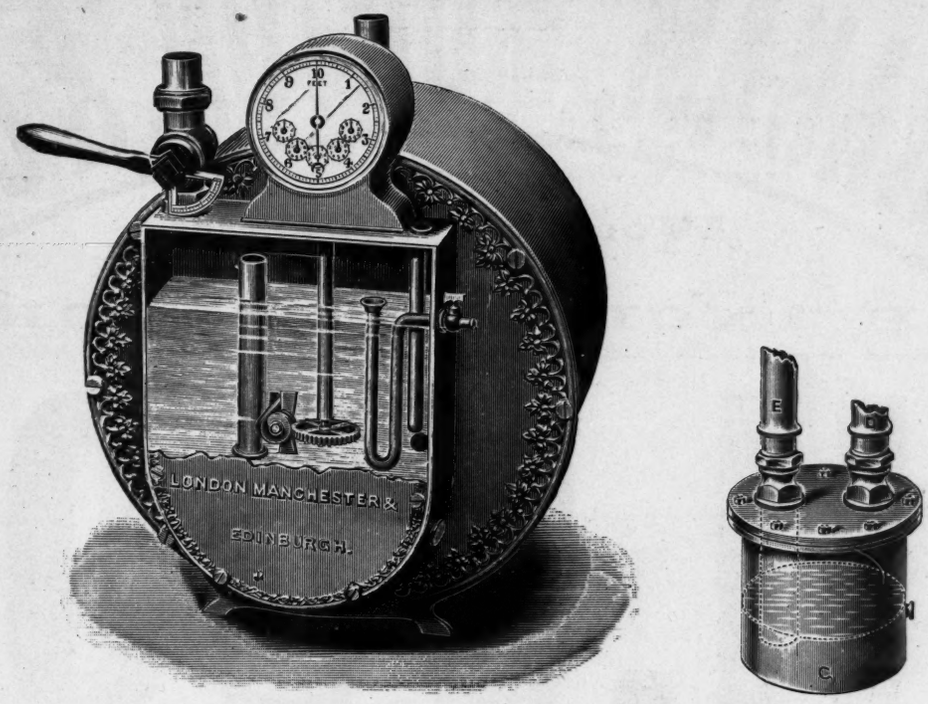

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